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# Regional cattle feeding: a comparative analysis of regional production costs of fed beef produced for the U.S. and Japanese markets

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by

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To Larry

and

to the memory of

H.F. Sankey

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# INTRODUCTION

The location of the U.S. cattle-feeding industry depends in part on the relative costs of shipping feed grains and feeder cattle and the regional prices of roughage and beef. As these economic conditions change, so do the optimal and actual locations of the industry. This paper uses 1989 data on cost of gain and cost of feeder steers to determine the most profitable regional locations for producing beef for the U.S. and Japanese markets.

The motivation for this research is that some of the conditions that led to the movement of the industry from the upper Midwest to the Southwest have been removed. These new developments include the elimination of tax rules favorable to large southwestern feedlots, improvements in the technology used to transport meat, and the dramatic increase in foreign demand for highly marbled beef.

Despite the importance of beef-fattening facilities to local economies, there is surprisingly little publicly available information on how regions compare. Because of this lack of information, the following section of this paper includes a historical overview of how the industry has moved and adapted since its inception and a description of how feeding regions, target weights, and industry structure vary in each of the three largest regions. The overview also serves to motivate the particular price-based methodology employed in this study. The third section describes the data sources and empirical analysis used in comparing production factors for the southern, central, and northern Plains with those for the Corn Belt. The fourth section applies the results of the empirical comparison to feeding cattle for the Japanese and U.S. markets. And finally, some general conclusions are provided.

# INDUSTRY OVERVIEW

## Historical Overview of the U.S. Cattle-feeding Industry

Cattle feeding existed in early American agriculture to utilize forage, crop residue, and grain. The cattle-feeding industry was continuously modified and moved westward geographically, depending on human population growth and distribution, advances in transportation, animal husbandry practices, and technological advancements in animal health care, feed, and meat processing (Whitaker, 1975; Gustafson and Van Arsdall, 1970).

Historically, cattle populations have been transported to the feed source instead of transporting the feed source to the cattle. Shipping Texas and Cherokee (Oklahoma) cattle to Illinois and Iowa occurred before the Civil War. In fact, demand in the eastern Corn Belt for transporting cattle helped develop the railroad shipping point in Abilene, Kansas, in 1867 (Whitaker, 1975). Railroads and their rates not only helped determine the original routes of cattle from range areas to feedlots, but may have partly influenced the location of feeding areas (Whitaker, 1975; Gustafson and Van Arsdall, 1970). As late as 1919, trucks hauled less than 2 percent of all cattle shipped to major public markets. But the development of the interstate highway system, good local highways, and large-capacity trucks reduced transit time from days to hours, which reduced shrinkage and stress on the cattle and made most areas of the country more accessible. By 1967, more than 97 percent of all cattle marketed were hauled in trucks (Gustafson and Van Arsdall, 1970).

Before 1960, cattle feeding was dominated by feedlots of less than 1,000-head capacity, in large part located in the Corn Belt (Gustafson and Van Arsdall, 1970; Reimund et al., 1981; USDA Cattle on Feed Reports). Entry into small-scale cattle feeding was virtually unrestricted. By vertically integrating grain production with cattle feeding, farmer feeders marketed grain crops, crop residue, and off-season labor through fed cattle (Whitaker, 1975; Gustafson and Van Arsdall, 1970; Reimund et al., 1981). As late as 1964, more than 60 percent of all fed cattle were marketed from feedlots with less than 1,000-head capacity (Whitaker, 1975; Gustafson and Van Arsdall, 1970; Reimund et al., 1981). Corn Belt cattle feeding centered in Iowa in the late 1800s and remained there until the late 1960s (Whitaker, 1975; USDA Cattle on Feed Reports; Iowa Agricultural Statistics, 1990). From 1968 to 1970, Iowa had the largest cattle-on-feed numbers in the state's recorded history (Iowa Agricultural Statistics, 1990).

But cattle feeding began shifting from the Corn Belt to the southern Plains (Gustafson and Van Arsdall, 1970; Reimund et al., 1981; Landon et al., 1984; Cleary et al., 1984), where grain sorghum production, spurred by irrigation, had created a feed-grain surplus. Mechanized systems for feed handling and animal waste disposal reduced the need for manual labor (Gustafson and Van Arsdall, 1970; Cleary et al., 1984). Biological advancements in pest control and medicine made it feasible to confine cattle in larger concentrations (Reimund et al., 1981).

The move to the southern Plains meant a drier climate, less population density, and cheaper land costs than those in the Corn Belt. Pollution programs to control runoff from animal waste were initiated by federal and state agencies, thereby increasing capital requirements and the comparative advantage of larger feedlots because the costs could be spread over more cattle per year (Reimund et al., 1981; Landon et al., 1984).

In a study prepared for the Iowa Cattlemen's Association in 1984, Landon et al. (1984) reported that pollution regulations in Texas and Iowa were very similar. But weather, population, and land costs caused these pollution controls to be more restricting for Iowa feedlots than for Texas feedlots. Greater rainfall and humidity reduce evaporation, thereby requiring runoff holding ponds for Iowa feedlots to be approximately twice the size of those for comparably sized Texas feedlots. Landon et al. also reported that Iowa's population was not as densely concentrated in metropolitan areas, which resulted in complaints by neighbors and frequent action by the Iowa Department of Environmental Quality.

Large-scale cattle-feeding operations went hand in hand with new organizational methods. Specialized labor skilled in livestock and grain procurement, accounting, nutrition, animal health, and management could be hired with per-animal costs diluted by the large number of animals (Gustafson and Van Arsdall, 1970; Reimund et al., 1981; Gee et al., 1979; Dietrich et al., 1985). This specialization allowed the vertical integration between grain production and cattle feeding to be managed separately, thus reducing seasonal cattle production (Reimund et al., 1981; Krause, 1991). Commercial feedlots operated year round, whereas farmer feeders fed cattle when labor was not used in crop production (Gustafson and Van Arsdall, 1970; Reimund et al., 1981; Krause, 1991). Management by a specialized labor force led to timely information. This timeliness and the volume of procurement and marketing may have been beneficial for the large commercial lots (Krause, 1991).

By separating feedlot ownership from cattle-on-feed ownership, large-scale custom cattle-feeding operations could attract a greater capital base from which to finance cattle (Reimund et al., 1981). Although traditional farmer feeders utilized home-grown grain and their own off-season labor, their major financial risk was carrying the seasonally produced cattle-on-feed inventories (Gustafson and Van Arsdall, 1970; Reimund et al., 1981; Krause, 1991). Fluctuations of fed-cattle prices within a given year have been as much as 25 percent (Krause, 1991). Investors outside traditional agricultural sources were attracted to cattle feeding, in part because of special income tax provisions that applied to agriculture and provided significant tax advantages to high-income individuals investing in cattle feeding (Reimund et al., 1981; Gee et al., 1979; Dietrich et al., 1977). This latter benefit of investment capital via tax advantages permitted commercially run feedlots to manage risk through custom feeding programs (Reimund et al., 1981).

Gee et al. (1979) used data from 1976-77 and reported that a significant difference arose in fed-beef costs between midwestern farmer feeders and western commercial lots. They observed that Corn Belt farmer feeders spent 68 percent of their total costs for feeder cattle and feed, compared with 89 percent spent by western commercial feedlots. The two greatest cost differences were in fixed costs such as depreciation, interest on investment, taxes, insurance and management charges, and other direct costs such as transportation, marketing, gas, oil, repairs, and labor. As mentioned, these differences were attributable in large part to economies of scale.

These cost advantages in favor of the larger-scale southwestern feeder eventually showed up in the location of the industry. By 1974, feedlots with less than 1,000-head capacity accounted for only 35 percent of all fed cattle. In 1976, less than 400 feedlots marketed one-half of the 24.2 million cattle fed that year. The number of Iowa feedlots of 1,000 head or less decreased by 41 percent from 1962 to 1980. With the decline of the farmer feeder, Iowa gave up its position as the number-one cattle-feeding state to Texas. The decline of feedlots was not specific to Iowa; during the same period, the total number of feedlots in the 13 major cattle-feeding states also decreased by 53 percent (Reimund et al., 1981; USDA Cattle on Feed Reports; Krause, 1991).

From 1955 to 1985, Texas increased yearly fed-cattle marketings by approximately 4.8 million head (2,116%), Kansas by more than 3.4 million head (676%), Nebraska by 3.3 million head (253%), and Colorado by 1.6 million head (295%). Of these four states, only Texas declined in yearly marketings from 1985 to 1989. Kansas, Nebraska, and Colorado continued to increase yearly fed-cattle marketings. Marketings in California and Illinois, after peaking in the mid-1960s, fell from 1965 to 1989 by 1.35 million head (59%) and 690,000 head (53%), respectively. Marketings in Iowa, after peaking in 1970, fell by 2.75 million head (60%) from 1970 to 1989 (Krause, 1991).

Complicating the issue of regional shifts in cattle feeding was a declining total cattle and calf inventory. After reaching a record high of 132 million head in 1975, inventories fell to approximately 111 million head by 1979, rebuilt to 115 million head in 1982, and then fell again (USDA January 1 Total Cattle Inventory Reports). This was the first time since the Civil War that a cyclical peak fell below the previous high, creating an overcapacity throughout the cattle industry (Nalivka, 1991). By January 1, 1990, the cattle inventory had declined to 99 million head, a 25 percent reduction from its peak in 1975 (USDA January 1 Total Cattle Inventory Reports; Nalivka, 1991). Nonetheless, from 1980 to 1989, the 13-state yearly fed-cattle marketings increased from 21.3 million to 23 million head, whereas the total number of feedlots in those states fell by 40 percent (Krause, 1991). Therefore, fewer feedlots were marketing more cattle as the process of consolidation continued. By 1989, slightly more than 1 percent of U.S. feedlots were marketing 73 percent of the total U.S. fed cattle (Krause, 1991). Only feedlots capable of managing the diversities of a changing industry were surviving within each region, and only the regions with competitive production costs were maintaining or gaining in fed-cattle populations.

<u>Survival of the fittest</u>

Although production cost comparisons tend to include regional and state inferences, it is ultimately the search for the optimal feedlot size that is desired. If we assume that the efficient feedlot effectively handles entrepreneurial problems such as labor relations, rapid innovation, government regulation and unstable markets, then one way to determine the most efficient scale would be to employ the survival technique.

> "The survivor technique proceeds to solve the problem of determining the optimum firm size as follows: classify the firm in an industry by size, and calculate the share of industry output coming from each class overtime. If the share of a given class falls, it is relatively inefficient, and in general is more inefficient the more rapidly the share falls."(Stigler, 1958).

Table 1 presents the distribution of fed marketings by feedlost size in the 13 major cattle feeding states for selected years from 1962-1989. As expected, the most inefficient feedlot size was under 1,000 head capacity. This category experienced a continuous loss of numbers and market share. Conversely, feedlots with 16,000 head and greater capacity enjoyed a continuous increase in number and market share. It is interesting to note that the catagories between 1,000-head and and 16,000-head capacity undulated in both numbers and market share over time. While data-gathering procedures undoubtedly affected the information,

Table 1. Distribution of marketing of fed cattle by feedlot size for top 13 states

| Feedlot size (head) | 1962[b] | 1972 | 1980 | 1989 | Percent (1962-1989) |
|---|---|---|---|---|---|
| | | 1. Number of feetlots[a] | | | |
| Under 1000 | 162,451 | 119,436 | 76,175 | 45,235 | -72 |
| 1000-1999 | 654 | 793 | 913 | 660 | +1 |
| 2000-3999[c] | 328 | 453 | 383 | 404 | +23 |
| 4000-7999 | 170 | 278 | 214 | 200 | +17 |
| 8000-15999[c] | 96 | 192 | 186 | 188 | +96 |
| 16000-31999[c] | 20 | 105 | 138 | 121 | +505 |
| 32000 and over | 3 | 38 | 61 | 75 | +2422 |
| Total | 163,722 | 121,295 | 78,071 | 46,883 | -71 |
| | 2. Percent yearly marketing by feedlot size | | | | |
| Under 1000 | 59.8 | 41.6 | 24.0 | 16.3 | -43.5 |
| 1000-1999 | 6.7 | 4.7 | 5.8 | 4.0 | -1.7 |
| 2000-3999 | 5.8 | 5.5 | 6.3 | 6.3 | +.5 |
| 4000-75999 | 8.6 | 8.1 | 7.3 | 7.3 | -1.2 |
| 16000-31999 | 5.2 | 16.6 | 20.4 | 20.5 | +15.3 |
| 32000 and over | 1.6 | 10.2 | 22.3 | 30.3 | +28.7 |
| Total head marketed 1000 | 12,256 | 21,810 | 21,306 | 22,955 | |

[a]Accumulated from state.
[b]1962 was the first year the Statistical Reporting Service (now National Agricultural Statistics Service) enumerated a reported fed cattle marketing by feedlot size.
[c]Lots from larger size groups were included to avoid individual disclosures when data were gathered at state level.

Source: Krause, Kenneth R. 1991. "Cattle Feeding 1962-89, Location and Feedlot Size." AER-642. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service.

this undulation could be partially attributable to feedlots owners mistakenly setting the feedlot size at the wrong level and adjusting.

Another option to consider is that the optimum size may be changing because of changes in factor prices or technology. These changes may be within a state or within the industry. Stigler brought forth one observation that is most applicable to the cattle feeding industry:

> "We must also recognize that a single optimum size of firm will exist in an industry only if all firms have (access to) identical resources. Since various firms employ different kinds or qualities of resources, there will tend to develope a frequency distribution of optimum firm sizes."(Stigler,1958)

There has been much research on the economies of size in the cattle feeding industry. The massive decline in feedlots numbers while fed cattle marketings held steady over the last decade is evidence of a consolidating industry. It only seems logical, even Darwinion, that those feedlots remaining after 25 years of consolidation, regardless of their capacity, are more efficient. It would also seem that the feedlot capacity housing the widest variance of efficiency would experience the greatest decline and upon completion of its decline, enjoy a narrower variance.

Certainly within any firm size there exists an optimally efficient feedlot. As stated, the efficient feedlot is the one that deals best with the problems of the entrepreneur. The optimal size will be influenced in part by the value that the entrepreneur places on his implicit costs. Therefore, given the expectations of the entrepreneur and the limitations specific to each state or region, an optimal plant size or a distribution of optimal feedlot sizes will exist.

Iowa and Illinois are examples of states with one optimal feedlot size given that in 1989, 69 percent and 79 percent of their respective fed cattle marketings came from feedlots of under 1,000 head capacity. Arizona and California are examples of the other extreme. In 1989, 98 percent and 81 percent of their respective fed cattle marketings were from feedlots of over 16,000 head capacity. Nebraska seems have a range of optimal sizes. In 1989, 25 percent of Nebraska's fed cattle marketed from feedlots of under 1,000 head capacity, 26 percent were marketed from feedlots between 2,000 and 7,999 head capacity, 22 percent marketings from 8,000 to 15,999 head capacities, and 22 percent from feedlots with 16,000 head and over capacities (Krause, 1991).

Note that, although the firm can be no smaller than the smallest feedlot, the upper limit of the firm size can exceed the largest feedlot's capacity. If, given the diversity of resources available to an industry, a frequency distribution of optimum firm sizes exists, then a firm owning several feedlots could achieve a size greater than the largest single feedlot. Table 2 lists the nations top 30 cattle feedlot firms, the number of feedlots they own, total one time capacity and average one time capacity.

The largest firm, headquartered in Texas, contains seven feedlots and has a combined one time capacity of 335,000 head, which implies an average one time capacity of 47,900 head. The largest single feedlot firm size is the sixteenth ranked single feedlot firm located in Arizona, which has a one time capacity of 95,000 head. Note that a firm's headquarter is not necessarily located where the feedlots are located, as evidenced by the fourth ranked firm headquartered in New York.

The top two cattle feedlot firms in 1989 marketed a combined total of 1,445,000 head representing 6 percent of the 13 state market share. The top three firms marketed more cattle than did all the Iowa feedlots in 1989.

Changes at the state and regional level

To grasp the effect consolidation had on each state requires a clear understanding of where feedlots were located, the proportion each feedlot size represented within the state and the rate of decline over time. Table 3 identifies the top 13 feeding states, the number of feedlots

Table 2. Feedlot size, 30 largest U.S. cattle feedlot[a]

| Firm headquarters | Number of lots | Total one time capacity | Average one time capacity |
|---|---|---|---|
| Texas | 7 | 335,100 | 47,900 |
| Colorado | 4 | 300,000 | 75,000 |
| Texas | 6 | 273,000 | 45,500 |
| New York | 5 | 270,000 | 54,000 |
| Missouri | 8 | 240,000 | 30,000 |
| Texas | 4 | 170,000 | 42,500 |
| Idaho | 3 | 170,000 | 56,700 |
| Texas | 3 | 160,000 | 53,300 |
| Texas[b] | 4 | 157,000 | 39,250 |
| Oklahoma | 3 | 155,000 | 51,700 |
| Nebraska | 3 | 135,000 | 45,000 |
| Colorado | 4 | 133,000 | 33,250 |
| California | 3 | 130,000 | 43,300 |
| Kansas | 4 | 107,000 | 26,750 |
| Texas | 4 | 101,100 | 25,250 |
| Arizona | 1 | 95,000 | 95,000 |
| Texas | 3 | 90,000 | 30,000 |
| Missouri | 2 | 85,000 | 42,500 |
| Texas | 2 | 80,000 | 40,000 |
| Nebraska | 7 | 80,000 | 11,400 |
| Kansas | 3 | 75,000 | 25,000 |
| Nebraska | 1 | 75,000 | 75,000 |
| Kansas | 2 | 72,000 | 36,000 |
| Texas | 1 | 70,000 | 70,000 |
| Texas | 2 | 66,000 | 33,000 |
| Kansas | 1 | 66,000 | 66,000 |
| Texas | 1 | 65,000 | 65,000 |
| Colorado | 5 | 65,000 | 13,000 |
| Nebraska | 2 | 55,000 | 27,500 |
| Nebraska | 3 | 50,000 | 16,700 |

[a]Top cattle feeding operation based on one-time capacity of yards that share common ownership and/or management.
[b]Does not include a fifth yard, capacity 30,000 head, which is leased out.

Source: Kay, Steve, 1990. Top 30 Cattle Feeders, Cattle Buyers Weekly, Petalume, California, August 27, 1990.

Table 3. Number of cattle feedlots by capacity and percentage change, 1962-89

| State | Under 1,000 head | | | Feedlot |
|---|---|---|---|---|
| | 1962[a] | 1970 | 1980 | 1989 |
| Thirteen States | | | | |
| Texas | 1,600 | 1,300 | 931 | 639 |
| Kansas | 14,947 | 8,868 | 3,252 | 1,626 |
| Oklahoma | 2,159 | 753 | 280 | 223[b] |
| Colorado | 1,200 | 654 | 200 | 130 |
| Nebraska | 23,991 | 18,400 | 12,525 | 8,320 |
| Idaho | 870 | 546 | 286 | 45 |
| Washington | 585 | 262 | 106 | 49[b] |
| South Dakota | 10,780 | 9,049 | 5,951 | 4,142 |
| Minnesota | 23,979 | 18,162 | 10,681 | 5,945 |
| Arizona | 95 | 8 | 4 | 7[b] |
| Iowa | 49,964 | 41,829 | 29,532 | 6,250 |
| California | 305 | 153 | 17 | 9 |
| Illinois | 31,976 | 23,952 | 12,410 | 7,850 |
| Total | 162,451 | 119,436 | 76,175 | 45,235 |
| | | | | |
| Thirteen States | | | | |
| Texas | 88.7 | 85.1 | 84.9 | 79.9 |
| Kansas | 99.7 | 98.5 | 92.9 | 85.6 |
| Oklahoma | 98.7 | 94.1 | 88.9 | 89.2 |
| Colorado | 93.8 | 78.0 | 50.0 | 44.1 |
| Nebraska | 98.7 | 97.3 | 97.1 | 94.5 |
| Idaho | 93.5 | 86.0 | 81.7 | 43.7 |
| Washington | 93.8 | 89.7 | 84.8 | 75.4 |
| South Dakota | 99.8 | 99.4 | 99.2 | 98.6 |
| Minnesota | 99.9 | 99.8 | 99.4 | 99.1 |
| Arizona | 50.3 | 13.1 | 12.1 | 46.7 |
| Iowa | 99.9 | 99.6 | 98.4 | 98.5 |
| California | 50.4 | 36.0 | 16.8 | 16.4 |
| Illinois | 99.9 | 99.8 | 99.3 | 99.4 |
| Total | 99.2 | 98.5 | 97.6 | 96.5 |

NA = not available, -- = not applicable. Note: 1962 was the first year that the Statistical Reporting Service (now National Agricultural Statistical Service) reported fed cattle marketing by feedlot size.

[a]Feedlots in the 23 states represented 97.7 percent of feedlots in 32 states.

[b]Lots from larger size groups were included to avoid disclosing individual operations.

Source: Krause, Kenneth R. 1991. "Cattle Feeding, 1962-89." AER-642. Washington, DC.: U.S. Department of Agriculture, Economic Research Service, April.

| capacity | | | | Percentage change, 1962-89 | | |
|---|---|---|---|---|---|---|
| 1,000 head and over | | | | Under | 1,000 | |
| 1962 | 1970 | 1980 | 1989 | 1,000 | and over | Total |
| 203 | 227 | 166 | 161 | -60.1 | -20.7 | -55.6 |
| 53 | 132 | 248 | 274 | -89.1 | 417.0 | -87.3 |
| 29 | 47 | 35 | 27 | -89.7 | -6.9 | -88.6 |
| 80 | 184 | 200 | 165 | -89.2 | 106.2 | -77.0 |
| 312 | 514 | 375 | 480 | -65.3 | 53.8 | -63.8 |
| 60 | 89 | 64 | 58 | -94.8 | -33.0 | -88.9 |
| 39 | 30 | 19 | 16 | -91.6 | -59.0 | -89.6 |
| 20 | 51 | 49 | 58 | -61.6 | 190.0 | -61.1 |
| 21 | 38 | 69 | 55 | -75.2 | 161.9 | -75.0 |
| 94 | 53 | 29 | 8 | -92.6 | -91.5 | -92.1 |
| 36 | 171 | 468 | 250 | -67.5 | 594.4 | -67.0 |
| 300 | 272 | 84 | 46 | -96.0 | -84.7 | -90.9 |
| 24 | 48 | 90 | 50 | -75.4 | 108.3 | -75.3 |
| 1,271 | 1,856 | 1,896 | 1,648 | -72.2 | 29.7 | -71.4 |
| Percent of lots | | | | | | |
| 11.3 | 14.9 | 15.1 | 20.1 | -- | -- | -- |
| .3 | 1.5 | 7,1 | 14.4 | -- | -- | -- |
| 1.3 | 5.9 | 11.1 | 10.8 | -- | -- | -- |
| 6.2 | 22.0 | 50.0 | 55.9 | -- | -- | -- |
| 1.3 | 2.7 | 2.9 | 5.5 | -- | -- | -- |
| 6.5 | 14.0 | 18.3 | 56.3 | -- | -- | -- |
| 6.2 | 10.3 | 15.2 | 24.6 | -- | -- | -- |
| .2 | .6 | .8 | 1.4 | -- | -- | -- |
| .1 | .2 | .8 | .9 | -- | -- | -- |
| 49.7 | 86.9 | 87.9 | 53.3 | -- | -- | -- |
| .1 | .4 | 1.6 | 1.5 | -- | -- | -- |
| 49.6 | 64.0 | 83.2 | 83.6 | -- | -- | -- |
| .1 | .2 | .7 | .6 | -- | -- | -- |
| .4 | 1.5 | 2.4 | 3.5 | -- | -- | -- |

over and under 1,000 head capacity plus the proportion of the total population and the percent change within each state.

A quick observation of the percentage change can be deceiving. Iowa for example experienced one of the smallest percentage declines of feedlots under 1,000 head capacity at 67 percent, yet this amounted to 33,714 feedlots. California, on the other hand, lost 96 percent of its feedlots under 1,000 head capacity for a total of 296.

Eastern Corn Belt-Illinois, Iowa, Minnesota

In 1955, Iowa, Illinois and Minnesota, while ranked as the nations top three corn producers respectively, were first, second and fourth in the nation in the concentration of feedlots with under 1,000 head capacity. Their combined total of 105,919 feedlots of under 1,000 head capacity made up 65 percent of the total for that category in the top 13 cattle feeding states. In all three states, feedlots of under 1,000 head capacity represented over 99.9 percent of their total feedlot population. Their combined market share from these feedlots equaled 37 percent of the 13 state total (Krause, 1991).

From 1962 to 1970, the three state area decreased its number of feedlots under 1,000 head capacity by 21 percent while increasing total fed cattle marketings by 44 percent (Krause, 1991).

By 1970, Illinois fed cattle marketings had already peaked and was declining. As stated earlier in this paper, Iowa was at its peak. Minnesota would peak within two years. Their combined market share, however, was falling and only represented 30 percent of the 13 state total (Krause, 1991; USDA Cattle on Feed Reports; Iowa Agricultural Statistics, 1990).

Between 1970 and 1980, with their corn production rising, total feedlots in these states dropped again, this time by 37 percent and marketings fell as well by 34 percent. By 1980, the three states marketings represented only 20 percent of the 13 state total (Krause, 1991).

From 1962 to 1989, the number of feedlots under 1,000 head capacity fell in these three states to 30,035, a decline of 72 percent. These remaining feedlots represented a larger proportion of the 13 state feedlots under 1,000 head capacity than in 1962 equaling 67 percent. Marketings from the three states during the same time frame fell 36 percent and represented only 13 percent of the 13 state market share (Krause 1991).

Southwest-California and Arizona

California and Arizona from the beginning of the post-World War II period were characterized by the dominance of large-volume cattle feeding (Hopkin and Kramer, 1965). In 1953, 30 percent of California's feedlots had a one-time capacity of more than 1000 head and contained 85 percent of the cattle on feed in that state (Hopkin and Kramer, 1965).

The impact of economies of scale for cattle feeding, in general, was documented as early as 1957 in California (Hopkin, 1957). A 1960 study of 40 states revealed that Southwest cattle feeders converted feed into liveweight more efficiently than did cattle feeders in any other climatic area of the United States (Hopkin and Kramer, 1965).

In 1962 California and Arizona contained 50 percent of the nations 96 feedlots with capacities between 8,000 and 15,999 head and **all** of the nations 23 largest feedlots which had capacities of over 16,000 head. By 1963, more than 98 percent of the cattle on feed in California were in lots with over 1000 head capacity. These lots made up 52 percent of the total California feedlots. By 1965, however, reports indicated that production costs were higher in California than in Texas (Hopkin and Kramer, 1965). Indications of over capacity were evident and predictions of consolidation were already being heard. Cattle feeding in California was migrating toward the southern third of the state, closer to feed supplies and away from regions dominated by smaller farm feedlots and expanding urban areas. Increasing populations meant increasing beef consumption, but it also meant increasing land values, environmental concerns, and water costs, which resulted in decreased local feed supplies and feeder cattle (Hopkin and Kramer, 1965). In 1965, marketings in California, then ranked third in U.S. fed cattle marketings, peaked. Arizona increased its marketings by 32 percent from 1965 to 1970 but could not offset California's decline. By the late 1960s, the Southwest peaked in fed cattle marketings (Krause, 1991).

The decline of the Southwest, characterized by its economies of scale and productions efficiencies, was almost simultaneous with the decline of the farmer feeder characterized by low feed costs. This situation was unique in that it may have provided early insight that economies of scale, feeding efficiencies, and large feed-grain surpluses could not individually create and maintain a substantial cattle feeding region.

In 1989, sixth-ranked California marketed 930,000 head of fed cattle out of 55 feedlots (Krause, 1991). One California firm with three feedlots sold 22 percent of that total (Kay, 1990). Arizona, ranked thirteenth out of the 13 major cattle feeding states, marketed 342,000 head from 15 feedlots. One Arizona feedlot sold 33 percent of the total (Krause, 1991; Kay, 1990).

Pacific Northwest-Idaho, Washington, and Oregon

In 1962, 93.5 percent of the feedlots in the Pacific Northwest were under 1,000 head capacity. Idaho had the most feedlots with 930, Oregon had 648, and Washington had 624. From 1962 to 1970, 32 percent of Idaho's feedlots closed, Oregon lost 45 percent, and Washington saw a decrease of 53 percent. These decreases amounted to a 43 percent decline in feedlots in the PNW, all of which occurred in lots with capacities of less than 1,000 head. While the number of feedlots with over 1,000 head capacity declined in Washington and Oregon, they rose in Idaho by enough to increase the number of larger lots in the PNW by 8 percent. From 1960 to 1970, fed cattle marketings for the region increased by 40 percent(Krause, 1991; Folwell, Mittelhammer and Boettcher, 1982).

Coinciding with the consolidation of feedlots and the increase in fed cattle marketings of the 1960s was a growing feed grain deficit. Because the PNW's agricultural processing industry was expanding, byproduct feeds were being used to cope with the feed-grain deficit and reduce costs. In particular, raw potatoes, potato waste, and beet and apple pulp were used (Gustafson and Van Arsdall, 1970;

Summers and Drury, 1971; Folwell, Mittelhammer and Boettcher, 1982).

The rapid starch breakdown of potato slurry when combined with the slower starch breakdown of barley is conducive to positive average daily gains and feed conversions (Nelson, Duncan and Martin, 1990; Duncan, Males, Nelson and Martin, 1990). To control ration cost, produce byproducts are essential to offset high grain prices and have been incorporated into cattle feeding programs for over 20 years (Feedlot Managers 1989-90; Duncan, Males, Nelson and Martin, 1990).

A competitive cost of production apparently was being achieved by economies of scale and by using byproducts of produce industries. During the 1970s, Washington's feed cost of production for a steer was calculated as similar to feed cost in Colorado. This analysis was done without accounting for the use of byproducts and likely would have added to the Washington's competitive advantage (Folwell, Mittelhammer and Boettcher, 1982). From January 1974 to August 1977, produce byproducts accounted for 60 percent of all feed purchases by the six largest feedlots on a total tonnage basis (Folwell, Mittelhammer and Boettcher, 1982).

The net change from 1970 to 1980 was a 24 percent decline in the number of feedlots with a 16 percent increase in total fed marketings. By 1980, less than 3 percent of the feedlots sold 78 percent of the fed cattle marketings (Folwell, Mittelhammer and Boettcher, 1982).

It is interesting to note that in 1988 an estimated 110,000 tons of potato process residue (dry matter) were available for animal feed (Duncan, Males, Nelson and Martin, 1990). Calculation using the estimate of 110,000 tons of feedable residue would suggest that the potato residue available in the three-state Pacific Northwest would only handle 555,000 head of cattle.[1] Because the growth of the PNW's cattle feeding industry has coincided with the expansion of the PNW's agricultural processing industries, this may signal a limitation to the number of cattle that can be fed in the Northwest and might explain why not all feedlots use potato residue.

The total fed cattle marketings in Washington and Idaho for 1989 were 1.053 million head sold from 168 feedlots (Krause, 1991). One Idaho potato processor with three feedlots owned and sold 290,000 head that year, representing

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[1]Assuming that a 750 pound feeder steer was placed on feed and fed for 140 days with an average daily gain of 3 pounds per day, the steer would be marketed weighing 1,170 pounds. If feed conversion was 6.75 pounds of gain (dry matter), the animal would consume 20.25 pounds of dry matter feed per day, of assumptions, a single steer would consume 397 pounds of potato residue (dry matter). This would indicate one ton of potato residue would finish slightly more than five steers.

almost 28 percent of the two states' marketings in 1989 (Kay, 1990).

Texas, Oklahoma, and New Mexico

Until post-World War II, the southern Plains states of Texas, Oklahoma and New Mexico were unaccustomed to feeding many cattle. In 1955, of the 13 states in the U.S. recording fed cattle marketings, Texas ranked last (Krause 1991).

But with the development of extruded aluminum pipe and advancements in plastic technology (two World War II developments) plus the development of high-volume irrigation pumps, the use of irrigation farming expanded into the Southern Plains (Reimund, Martin and Moore, 1981).

The result was explosive. From 1950 to 1960, the feed-grain excess in the Southern Plains improved by 1,459 percent (Gustafson and Van Arsdall, 1970). The number of available beef calves and male dairy calves in the South Plains more than doubled from 1950 to 1969 ( Gustafson and Van Arsdall). These changes in supply and technology led to rapid expansion in the cattle feeding industry of the south plains area.

In 1962, 4,121 feedlots were operating in the three-state-area, with 44 percent located in Texas. By 1965, Texas ranked fifth in the United States in fed cattle marketings, with the three-state area representing almost 9 percent of total U.S. production (Krause, 1991).

By 1968, 71 percent of feed cattle marketings in Texas were located in the Panhandle-Plains region of the state, which extended as far south as Abilene, Texas. The majority of the remaining marketings (17 percent) consisted of the lighter weight heifer feeding program located in the Rio Grande-Plains area (Dietrich, Thomas, and Farris, 1985).

From 1962-1970, Texas, Oklahoma, and New Mexico lost 42 percent of their feedlots while increasing fed cattle marketings 280 percent. Texas ranked third in the nation in fed cattle marketings increasing its fed cattle marketings by 315 percent during the same time frame (U.S.D.A. Cattle on Feed Reports; Krause, 1991). By 1970, the Southern Plains represented 16.4 percent of total U.S. fed cattle marketings.

By 1975, Texas was the number one state in fed cattle marketings, with the Southern Plains making up 18.8 percent of the U.S. total (U.S.D.A. Cattle on Feed Reports; Krause, 1991). In 1980, Texas was still number one in fed cattle marketings, with over 85 percent of its 4.16 million marketed head coming out of the Panhandle area. The Southern Plains marketed over 22 percent of total U.S. fed cattle that year from 1,443 feedlots, which represented a 40 percent decrease in the number of feedlots. Oklahoma's marketings peaked in 1978 (U.S.D.A. Cattle on Feed Reports; Dietrich, Thomas, and Farris 1985; Krause 1991).

By 1985, Texas, still ranked first in the nation, was marketing over 5 million head of cattle a year (Krause 1991). However, the Tax Reform Act of 1986 was designed to discourage tax-motivated investments, some of which were found in fed beef production. It was estimated that some ownership of cattle on feed would shift to feedlot operating companies and away from custom feeders. The changes in the federal tax law became effective in 1987-1990 (Conner et al., 1987).

In 1989, Texas lost its number one spot in marketing to Nebraska. From 1955 to 1989, Texas had increased its fed cattle marketings by 1,990 percent, by far the largest increase of any of the 23 major cattle feeding states (U.S.D.A. Cattle on Feed Reports; Krause 1991). Oklahoma and Texas combined marketed 24 percent of the fed cattle that year. The number of feedlots in Oklahoma and Texas declined from 1962 to 1989 by 74 percent (Krause 1991). However, twelve of the largest 30 U.S. cattle feedlot firms were headquartered in Texas(11) and Oklahoma(1) owning a total of 40 feedlots. The one time capacity of all 40 yards equaled 1.72 million head (Kay, 1990).

Colorado

In 1955, Colorado was ranked fifth in the nation in fed cattle marketings, making up approximately 6 percent of the U.S. total (Krause, 1991). While still ranked fifth in the nation and increasing its fed cattle marketings by 38 percent from 1955 to 1960, Colorado was barely maintaining its market share. In 1962, Colorado had 1,280 feedlots in operation, 94 percent of which were under 1,000 head capacity (U.S.D.A. Cattle on Feed Reports; Krause, 1991).

A 1964 study by Colorado State University found that 86 percent of the state's feedlots were under 500 head capacity and marketing only 19 percent of the state's fed cattle (Madsen, Jummels, and Capener, 1966). Seventy-two percent of the state's cattle were marketed from the northeast quarter of the state, the region closest to Nebraska.

Between 1960 and 1965, Colorado's marketing increased by 55 percent. From 1962 to 1970, the number of feedlots with under 1000 head capacity declined by 46 percent while the number of feedlots with over 1000 head capacity increased by 130 percent for a net decline of 35 percent. In 1970, fifth ranked Colorado, marketed 7.7 percent of the U.S. fed cattle marketing out of 838 feedlots.(U.S.D.A. Cattle on Feed Reports; Krause, 1991) During the next ten years, the number of feedlots under 1000 head declined by 70 percent while the number of feedlots with over 1000 head capacity increased by 9 percent for an overall loss of 52 percent. By 1980, Colorado was still ranked fifth nationally in fed cattle marketings having increased it marketings from 1970 by 2 percent. The total feedlot population was down to 400 (U.S.D.A. Cattle on Feed Reports; Krause, 1991).

In 1987, nine continuous counties of northeast Colorado marketed over 74 percent of the states fed cattle. The greatest majority of the remaining states marketings, 17 percent, came from five continuous counties in southeast Colorado which generally lie along the Arkansas River Valley.(U.S. Census of Agriculture, 1987)

In 1989, with a total of 295 feedlots, Colorado ranked fourth in fed cattle marketings with 10 percent of the United States market share.(Krause, 1991) In addition, three of the nations top 30 cattle feedlot firms were headquartered in Colorado. These three firms own a combined total of 13 feedlots with a total one time capacity of about 500,000 head.(Kay, 1990)

Kansas

Kansas, was generally calculated to be part of a grain excess area as early as 1950 (Gustafson and Van Arsdall, 1970). Similar to the southern Plains, post Wold War II technology had profound influence on Kansas crop and fed cattle production. From 1955 to 1985, corn, grain sorghum and wheat production rose 346 percent, 792 percent and 237 percent respectfully (Krause, 1991). The intrastate move and structure change of cattle feeding over the next 40 years was equally profound.

In 1962, 99.7 percent of Kansas's feedlots were under 1,000 head capacity from which 68 percent of the state's total fed cattle marketings were generated. Approximately 35 percent of the production came from the northeast quarter of the state, the largest proportion of the states total. Kansas ranked sixth in the nation in fed cattle production and had 6 percent of the top 13 state market share (U.S.D.A. Cattle of Feed Report; U.S.Department of Commerce; Krause, 1991).

By 1970, the number of feedlots under 1,000 head capacity, within the state, had dropped by 41 percent and their marketings only represented 26 percent of the states total. Feedlots of over 1,000 head capacity increased by 150 percent. Kansas was still ranked sixth in the nation in fed cattle marketings but had almost 9 percent of the 13 state market share (U.S.D.A. Cattle on Feed Reports; Krause, 1991).

From 1970 to 1980, feedlots under 1,000 head capacity fell 63 percent while feedlots of over 1,000 head capacity rose 88 percent. In 1989, only seven percent of the states fed cattle marketings came from feedlots of under 1,000 head capacity. Kansas was now ranked third in the nation in fed cattle marketings and represented 14 percent of the top 13 state market share (U.S.D.A. Cattle on Feed Reports; Krause, 1991).

By 1989 feedlots of under 1,000 capacity in Kansas, had fallen by 50 percent from 1980, and make up less than two percent of the states 1989 fed cattle marketings (U.S.D.A. Cattle on Feed Reports; Krause, 1991).

From 1962 to 1989, the total number of feedlots under 1,000 head capacity, fell 89 percent while feedlots with over 1,000 head capacity rose 88 percent. The industry also shifted to the southwestern quarter of the state where in 1989, 65 percent of all Kansas's fed cattle were marketed. In fact, 49 percent of Kansas's 1987 fed cattle marketings came from 8 continuous counties in the southwestern part of the state (U.S. Department of Commerce, 1987; Krause, 1991).

Nebraska

In 1955, Nebraska, a grain surplus state, marketed 14.5 percent of the United States fed cattle marketings ranking it second in the nation. From 1955 to 1965, Nebraska increased its corn production 132 percent and its grain sorghum production by 1432 percent. Nebraska also increased its yearly fed cattle marketings by 87 percent during the same time frame (Gustafson and Van Arsdall, 1970; Krause, 1991).

Perhaps one of Nebraska's most unique distinctions is that while having the third largest number of feedlots under 1,000 head capacity in 1962, it was number one in the number of feedlots with over 1,000 head capacity. The total number of feedlots equaled 24,303. By 1970, the number of feedlots under 1,000 head capacity had fallen 23 percent while the number of feedlots with over 1,000 head capacity increased by 40 percent for a net decline of 22 percent. The same year, second ranked Nebraska marketed 3.6 million cattle for 14.5 percent of the market share (Krause, 1991).

From 1970 to 1975, Nebraska fed cattle marketings fell 22 percent yet only gave up a scant 1 percent of the United States market share and was still ranked second, this time behind Texas. By 1980, Nebraska had increased its fed cattle market share to 16.5 percent by increasing its yearly fed cattle marketing in five years by 37 percent. From 1970 to 1980, a decline in both catagories of feedlot sizes occurred for a net loss of 32 percent (Krause, 1991).

Although the total number of feedlots declined by 34 percent from 1978 to 1988, all the reduction occurred in feedlots with under 1,000 head and 1,000 to 2,000 head capacity. Feedlots with 2,000 to 32,000 head capacities rose during the same period by nearly 65 percent. Fed cattle marketings hit a record high in 1988 of 5.12 million head, and cattle placements hit a record high in 1989 of 5.46 million head (Nebraska Agricultural Statistics, various issues).

During this period of declining feedlots and increased placements and marketings, a shift was occurring in Nebraska feedlot locations. In 1980, the eastern one-third of Nebraska utilized 61 percent of the state's placement cattle; by 1989 this figure was only 47 percent. The difference was scattered throughout the balance of Nebraska, especially along the Platte River Valley. It is important to note, however, that the eastern one-third did not decrease the number of cattle on feed but rather, increased it by 5 percent from 1980 to 1989. In slightly more than a decade, Nebraska spread its cattle feeding industry westward and decreased the number of feedlots while increasing capacity, placements, and marketings (Nebraska Agricultural Statistics, various issues).

Of all the 23 states researched, Nebraska was the only one to consistently rank in the top four states for fed cattle marketings from 1955 to 1989. During the same time frame Nebraska moved from being the sixth largest producer of corn in 1955 to the third largest producer of corn in 1985 by increasing its output 787 percent. In addition, grain sorghum production increased 1850 percent (Krause, 1991).

From 1962 to 1989, Nebraska witnessed a 65 percent decline in feedlots under 1,000 head capacity. Of the major 13 cattle feeding states only Texas and South Dakota suffered from a lower percentage loss of the same class (Krause, 1991).

In 1989, Nebraska was ranked number one in fed cattle marketings with 22 percent of the United States market share being sold out of 8800 feedlots. Feedlots under 1,000 head capacity equaled 8320 about one half the number found in Iowa yet marketings were about equal. This would imply that, on the average, Nebraska's feedlots of under 1,000 head capacity with respect to marketing, are twice as large as Iowa's. Nebraska still had more feedlots with over 1000 head capacity than any other state in 1989. In addition, five of the nations top 30 cattle feedlot firms were headquarted in Nebraska owning total of 16 feedlots with a one time total capacity of 395,000 head (Kay, 1990).

Figure 1 illustrates the change in feedlot marketings and number of feedlots during the last 25 years. Although total cattle inventories have been relatively stable since 1989, the number of feedlots continues to decline, but at a slower rate. By the early 1980s, however, evidence began to surface indicating that the larger-volume feedlots of the

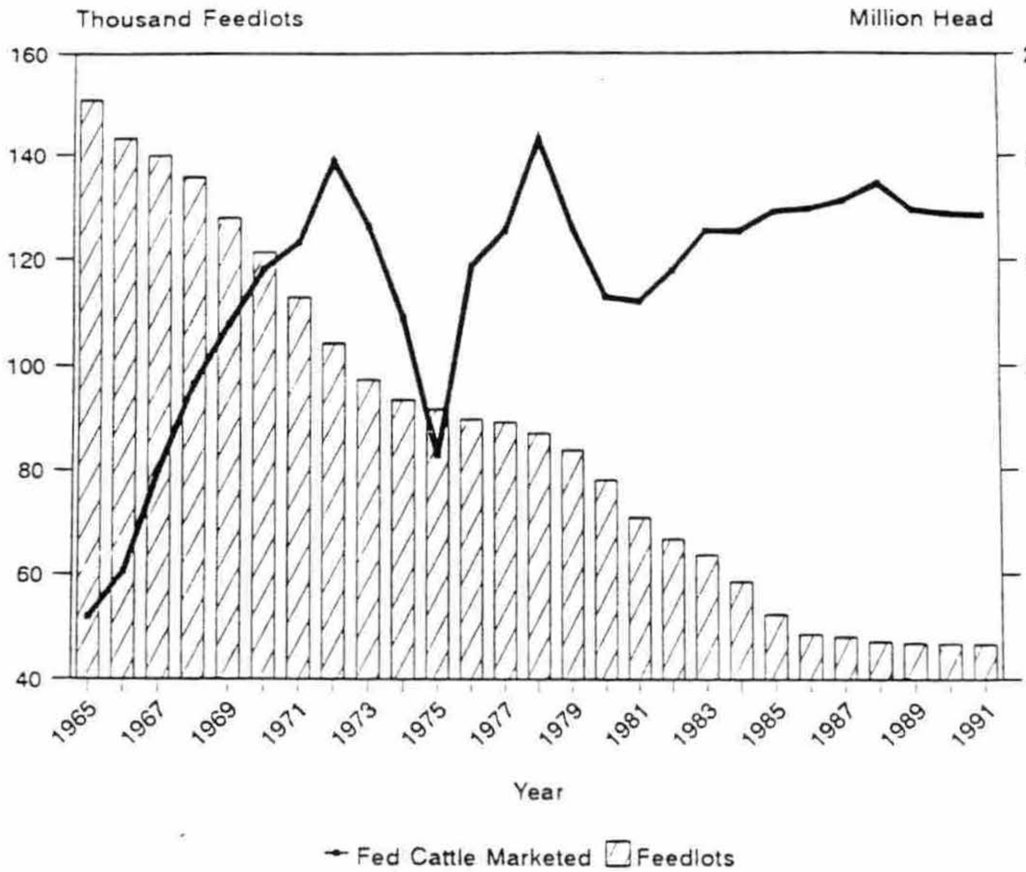



Figure 1. Feedlot marketings and number of feedlots, 13 states, 1965-1991

Source: Sterling Marketing, Inc.

western Corn Belt were regaining their competitive edge. High Plains feed-conversion rates, although still better than those in the Corn Belt, were not directly offsetting the improving Corn Belt feeding performances plus ration cost advantages (Trapp, 1984). In other words, larger feedlots and improved feeding efficiencies in the western Corn Belt and cheaper ration costs were diluting the cost-of-production advantages of the High Plains.

## Major Cattle-Feeding Regions

Figure 2 illustrates total U.S. cattle-feeding and marketing concentrations. As shown, three areas of the United States market a majority of the fed cattle: the West, generally described as lying west of the Continental Divide; the Plains, generally described as lying east of the Rocky Mountains and west of the Missouri River Valley; and the Corn Belt, those corn-producing areas including the Missouri River Valley, east to and including the Ohio River Valley. Each region can then be subdivided, depending on geographic location, according to supplies of feeder cattle and feed sources.

The West can be subdivided into two regions: the Southwest, made up of California and Arizona, and the Pacific Northwest, primarily made up of Washington and Idaho. The Plains can be subdivided into three regions: the southern, central, and northern Plains, including Texas, New Mexico, Oklahoma, Kansas, Colorado, and the western two-thirds of Nebraska. The Corn Belt consists Iowa, Minnesota, Illinois, and the eastern one-third of Nebraska and South Dakota. Figure 3 shows feedlot numbers and cattle of marketed in the 13 major cattle-feeding states during 1989.

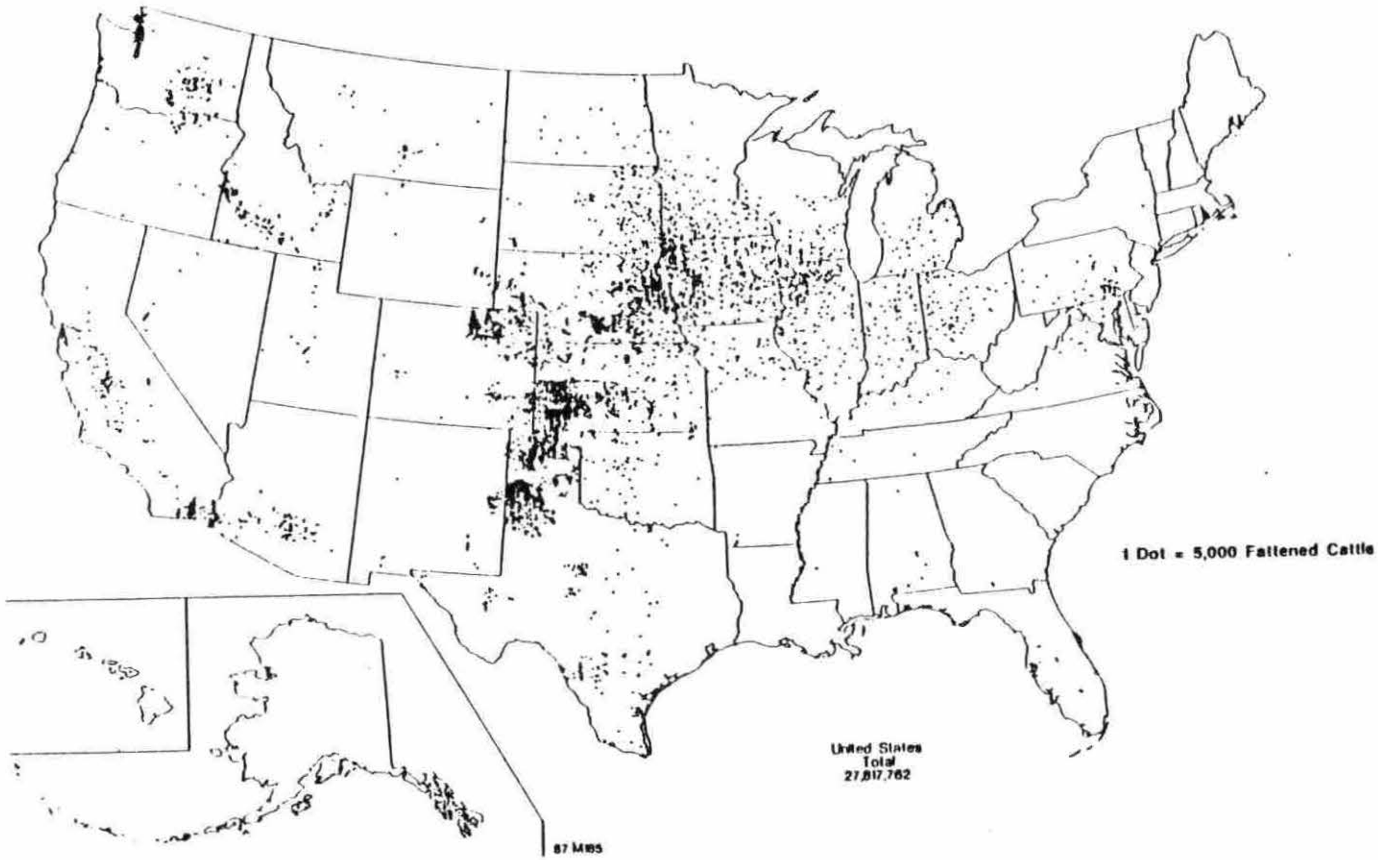
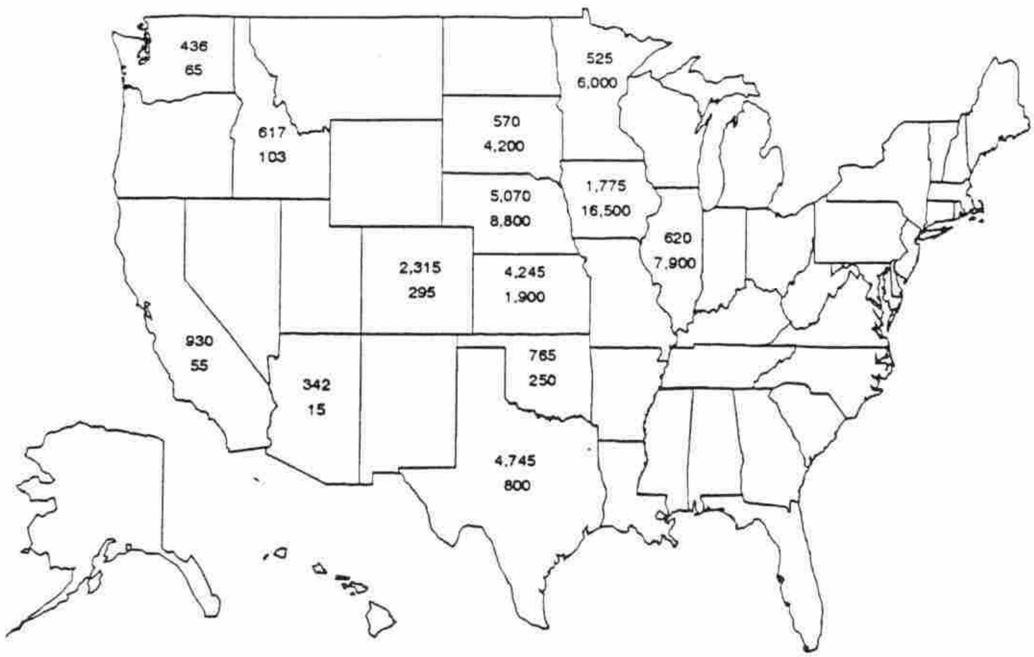



Figure 2. Cattle fattened on grain and concentrates and sold, 1987

Source: U.S. Department of Commerce.




The top numbers indicate number of marketings (1,000 head).
The bottom numbers indicate number of feedlots.

Figure 3. Cattle marketed from feedlots and numbers of feedlots, 1989

Source: Sterling Marketing, Inc.

## Empirical Analysis

The preceding section subjectively discusses how costs-of-production changes affected different types of cattle-feeding operations and how these cost differences have caused the industry to move. In such a competitive business, a small cost difference may lead to a relatively large movement in the industry, and this movement should, in turn, reduce or eliminate the original cost difference. This implies that, at any point in time, small but significant differences in feeding costs will exist. These differences may not be sufficiently large to appear in the publicly available data because the published data typically represent an average producer and often are deficient in coverage of statistics such as purchase weights (or in-weights) and ration costs. In addition, the publicly available budget data often are incompatible for purposes of direct comparison.

The data discussed and analyzed next are from actual feedlot accounts from a group of feedlots selected to represent the average for each region. In total, 2.23 million steers are reported in this data base. Some individuals who supplied these data are understandably reticent to be mentioned by name and, given the importance of these feedlots to some local economies, by location. In the paragraphs that follow, a brief description of the regional sources is provided. This description is followed by detailed comparisons of actual records.

## Data Analysis

The data for the southern Plains are taken from feedlot records from seven feedlots from the Texas Panhandle (south of the Canadian River) to San Angelo. These feedlots sold more than 212,000 steers in 1989. The central Plains data include the Texas Panhandle (north of the Canadian River), northwestern Oklahoma and its panhandle, the southwestern one-third of Kansas, and the southeastern quarter of Colorado. The data are taken from actual closeouts on more than 1.474 million steers from feedlots that averaged slightly more than 50,000 head of steer marketings in 1989. The northern Plains consists of northeastern Colorado, northern Kansas, and the western two-thirds of Nebraska. The data are taken from actual closeouts on approximately 400,000 steers from feedlots that averaged slightly more than 19,000 head of steer marketings in 1989.

The Corn Belt is subdivided into three areas: the eastern one-third of Nebraska, with actual closeouts on 31,000 steers; the state of Iowa, with actual closeouts on 77,000 steers; and the northwestern one-third of Illinois, with actual closeouts on 36,000 steers.

## Comparison of the Regional Records

### Total initial cost and initial weights

Total initial cost (TIC) is the beginning delivered cost of a steer, which includes the price of the steer plus the transportation cost for delivery to the feedlot. Initial weight (IW), often called pay weight, is the starting weight of the steer entering the feedlot used to determine the total initial cost. Initial cost is a value per hundred pounds of liveweight determined by [TIC/IW] * 100.

Figure 4 presents initial costs and weights of steers on a regional basis. Initial weights and costs per head followed a distinct pattern. In the Plains regions, steer in-weights became progressively heavier when fed further north. This trend did not hold true in the Corn Belt. In-weights were comparable between Iowa and Illinois, but initial weights and costs per head in eastern Nebraska were more similar to those in the northern Plains, where the heaviest in-weights occurred.

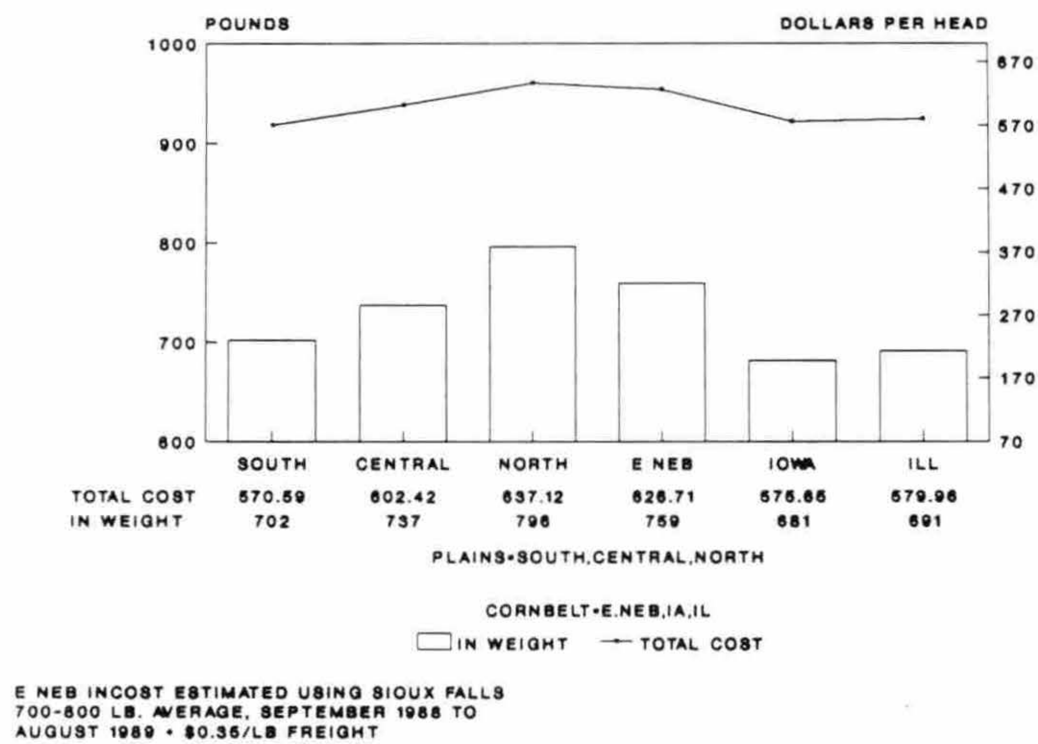



Figure 4. Total initial cost and initial weight per head by region

Approximately 30 percent of the steers in Iowa and northern Illinois weighed less than 600 pounds when entering the feedlot; in eastern Nebraska this figure was 12 percent. The southern Plains placed approximately 20 percent of total feeder cattle weighing less than 600 pounds, the central Plains placed 10 percent, and the northern Plains placed only 1 percent.

Ending weight and total weight gain

Ending weight (EW) is the weight of a steer at the time of exit from the feedlot, presumably for slaughter. Ending weight is the weight purchased if cattle are bought on a liveweight basis and also is used to determine the break-even cost of the final product. Total weight gain (TG) is the ending weight minus the initial weight: TG = EW - IW. Figure 5 shows total weight gained per steer on a regional basis.

The ending weights of steers exiting regional feedlots followed a distinct pattern. Although the central Plains started with feeder steers averaging 35 pounds heavier than those placed in the southern Plains, the results were finished products within four pounds of each other. Ending weights in the Plains became increasingly heavier when moving increased when moving from east to west. The heaviest ending weights centered in the northern Plains.

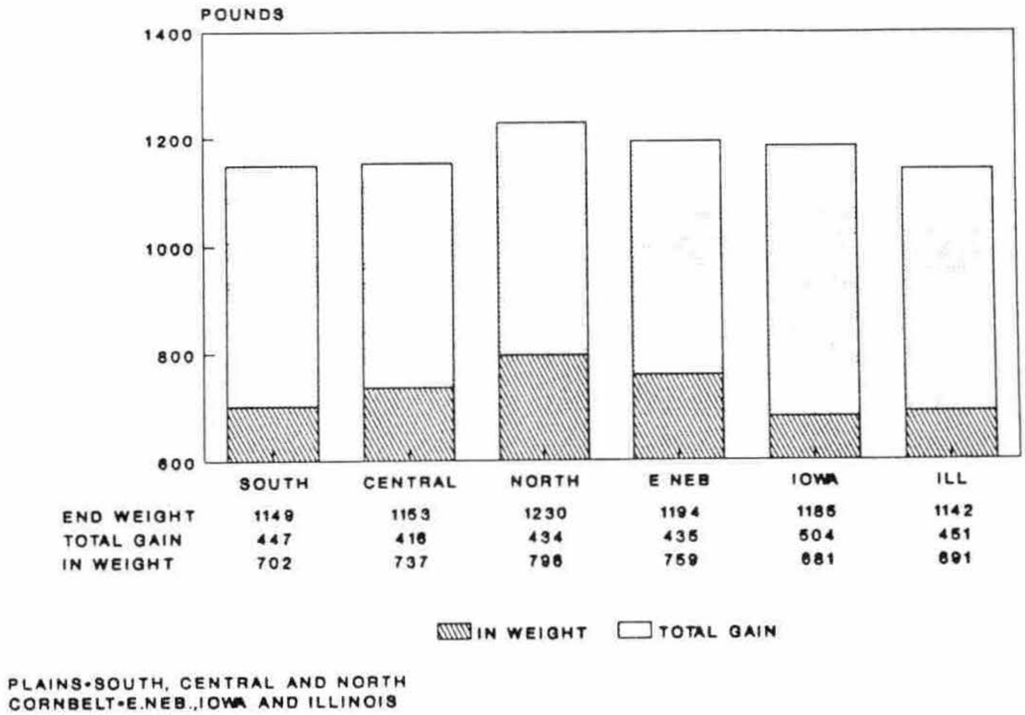



Figure 5. Initial weight, ending weight, and total weight gain per head by region

The greatest liveweight gain occurred in the regions that started with the lightest steers; in other words, Iowa, Illinois, and the southern Plains. Although average ending weights in the northern Plains are 36 pounds heavier than those in eastern Nebraska, total liveweight gain is almost identical.

Iowa feedlots produced almost 43 percent of their ending weights in the form of liveweight gain; Illinois and the southern Plains produced approximately 40 percent and 39 percent, respectively, and eastern Nebraska and the central Plains produced approximately 36 percent. The heaviest ending weight occurred in the northern Plains, where only 35 percent of liveweight gain was put on in the feedlots, the least of all regions observed.

Average days on feed and average daily gain

Average days on feed (ADF), is the calculated number of days that a steer within a given population is in the feedlot. Average days on feed is the total number of days every steer within a given population is on feed, known as total head days, divided by the number of steers in a given population when closed out. Average daily gain (ADG) is an average of liveweight (in pounds) gained on a daily basis while the steer is in the feedlot: ADG = TG/ADF.

When average days on feed was compared with average daily gain, a grouping became apparent (see Figure 6). Central and northern Plains, and eastern Nebraska had cattle on feed for fewer days but achieved a greater average daily gain. Feeders in Iowa, Illinois, and the southern Plains, all of whom placed lighter cattle, fed them longer and achieved smaller average daily gains.

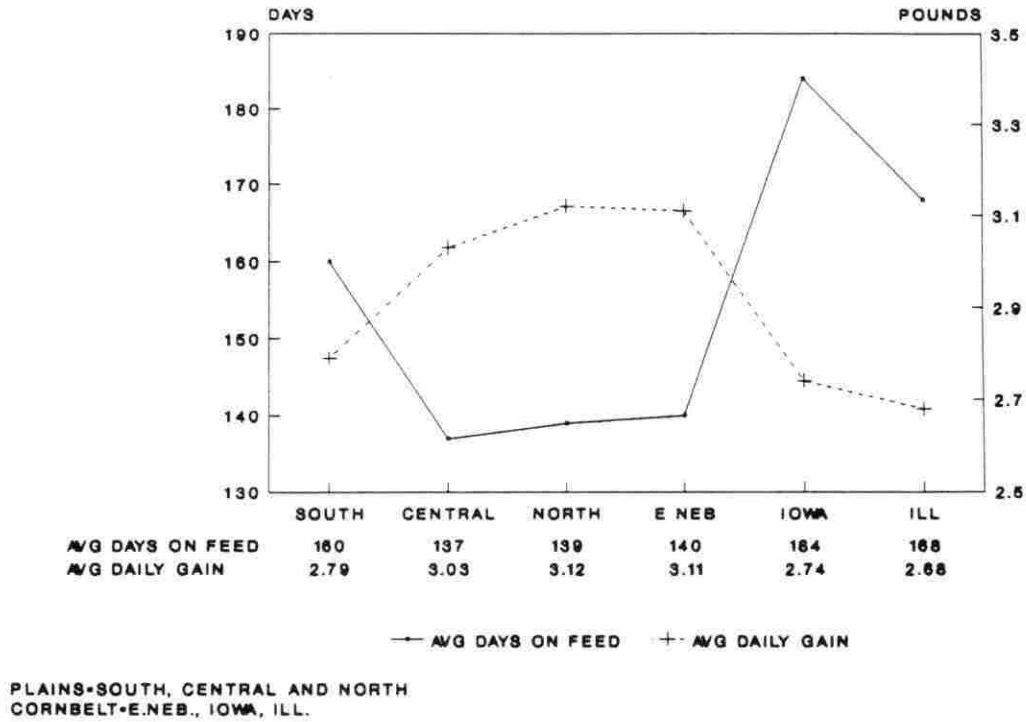



Figure 6. Average days on feed versus average daily gain per head, by region

Cost of gain per ton of feed

A 1989 survey of the three Plains regions revealed that per-ton finished ration costs tended to decrease when moving from the southern Plains to the northern Plains. Costs were \$156.21/ton in the southern Plains, \$151.56/ton in the central Plains, and \$141.13/ton in the northern Plains.

Although finished ration costs were not available for all regions, markups were (except for eastern Nebraska, which was estimated). Markups generally encompass the feedlot cost of operation and profit and may be included in the total bill as either markup per ton of feed or daily yardage fee or a combination of both. In the data provided, markup was calculated per ton of feed. Note that markups declined in the Plains when moving from south to north.

Cost of gain per ton of feed includes all costs incurred per head after the total initial cost and the ending weight are divided by the tons of feed consumed per animal. These costs include feed, initial medical costs and feedlot preparation, processing, morbidity, and mortality. The greater the weight gain per pound of feed, the lower the cost per ton of feed consumed. Cost of gain per ton of feed does not necessarily indicate or imply finished ration costs.

Although cost of gain per ton of feed is basically the same in the southern and central Plains, a trend toward lesser cost of gain per ton of feed occurred from south to north in the Plains and continued eastward, centering in Iowa, and rose again when continuing east into Illinois (see Figure 7).

Feedlot markup

Feedlot markup as a percentage of cost of gain per ton of feed in the Plains regions showed a downward trend from south to north, at 16.7 percent in the south Plains, 15.9

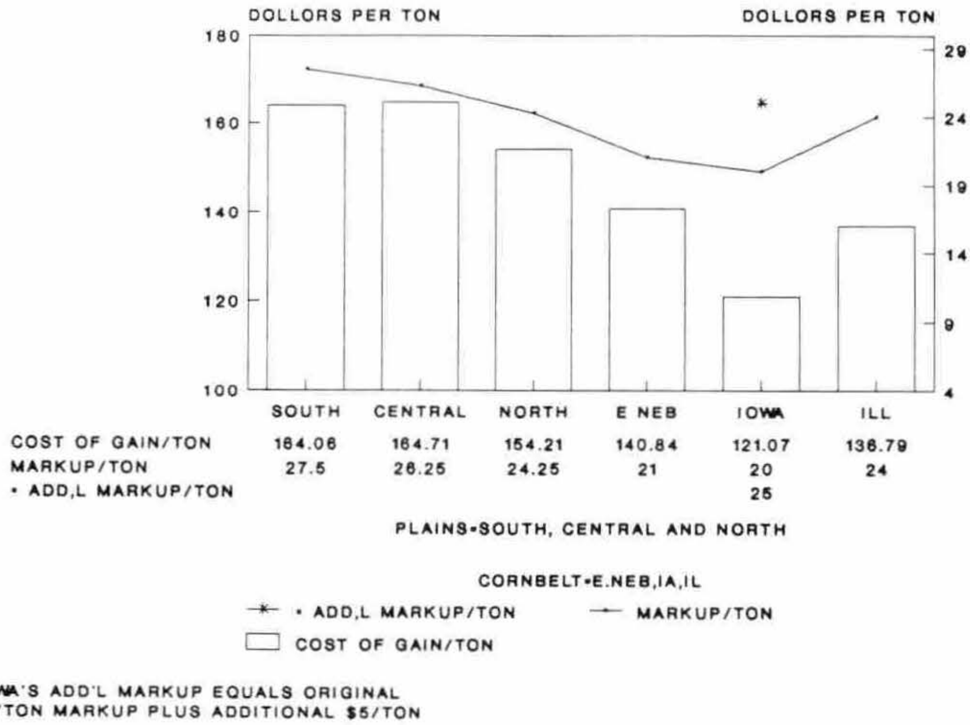



Figure 7. Total gain cost and markup per ton of feed

percent in the central Plains, and 15.7 percent in the northern Plains. The $20/ton markup in Iowa represented 16.5 percent of the cost of gain per ton of feed, almost the same as in the southern Plains; Illinois had the greatest markup, at 17.5 percent.[1]

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[1]Data provided by the Iowa State University Extension Service indicated a markup for 1989 of $20/ton. If $20/ton of feed covers the cost of operation, then adding an additional $5/ton in essence adds a merchandising value to the feed. Based on the ISU data, the average steer consumed 1.887 tons of feed. The additional $5/ton markup then equates to $9.43 per head. Based on the average ending weight for an Iowa steer (1,185 pounds) in 1989, this equates to $0.80/cwt of liveweight. In other words, if the $20/ton markup covers the cost of operation, then the Iowa feedlot would be marketing feed through a steer for an additional

Feed-conversion rates

Feed conversion is the ability to convert feed rations into pounds of liveweight. The feed-conversion rate is the pounds of feed consumed per weight gain, for which all feed is calculated on a 100 percent dry-matter basis. The greater the feed-conversion rate, the more pounds of feed needed to produce one pound of liveweight and the less efficient the weight gain.

Figure 8 compares regional cost of gain per ton of feed to corresponding feed-conversion rates. Generally, the Plains regions, although registering the greatest cost of gain per ton of feed, enjoy a distinct advantage in feed-conversion rates. The Corn Belt, with a lesser cost of gain per ton of feed, is at a distinct disadvantage with regard to feed efficiencies. It is not surprising to find that steers in Iowa and Illinois, with the least cost of gain per ton of feed, greatest feed-conversion rate, and most total weight gain, consume the most total feed per head, at 1.89 tons/head and 1.65 tons/head, respectively. The central Plains, with the greatest cost of gain per ton of feed, least feed-conversion rate, and least total weight gain, uses the least total feed per head, at 1.32 tons.

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$5/ton. Therefore, from this point on, Iowa's feed costs will include the additional $5/ton markup and cost of gain per ton of feed will be calculated at $126.07.

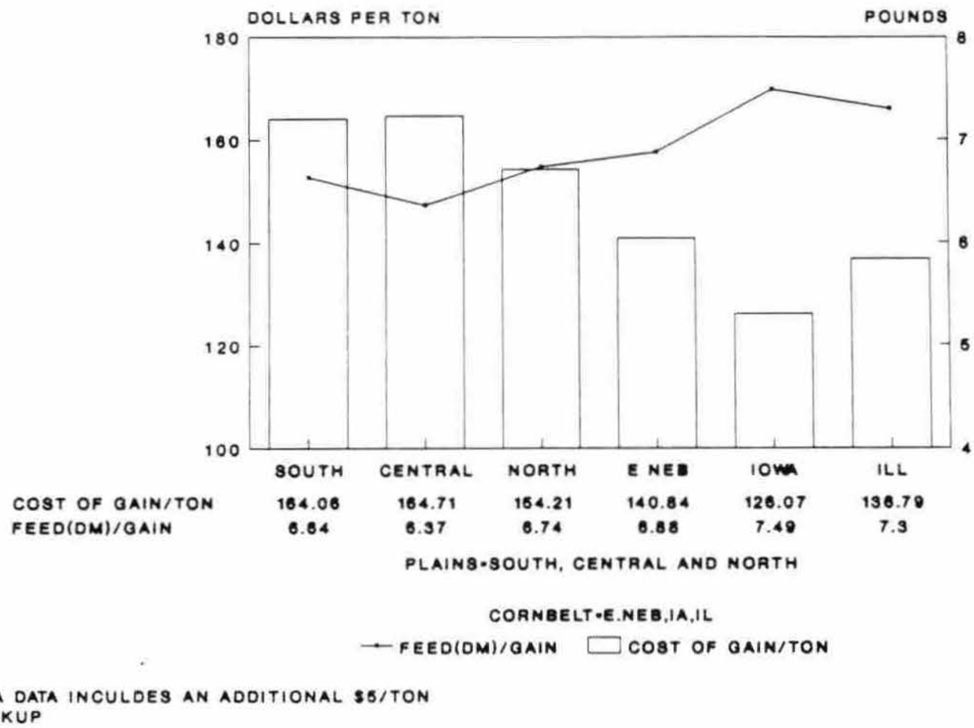



Figure 8. Feed conversion rate versus total gain cost per ton of feed per head, by region

Cost per pound of gain

The cost to produce one pound of liveweight, although dependent on production cost per ton of feed, can be influenced by how efficiently the feed is converted into liveweight. If the combination of feed and nonfeed costs are low enough, yet still effective in producing the desired product, poor feed-conversion rates may not be as damaging. Conversely, if the combination of feed and nonfeed costs yield a greater production cost per ton of feed, it is possible to generate a competitive cost of liveweight gain with feed efficiencies. Figure 9 illustrates regional costs per pound of gain.

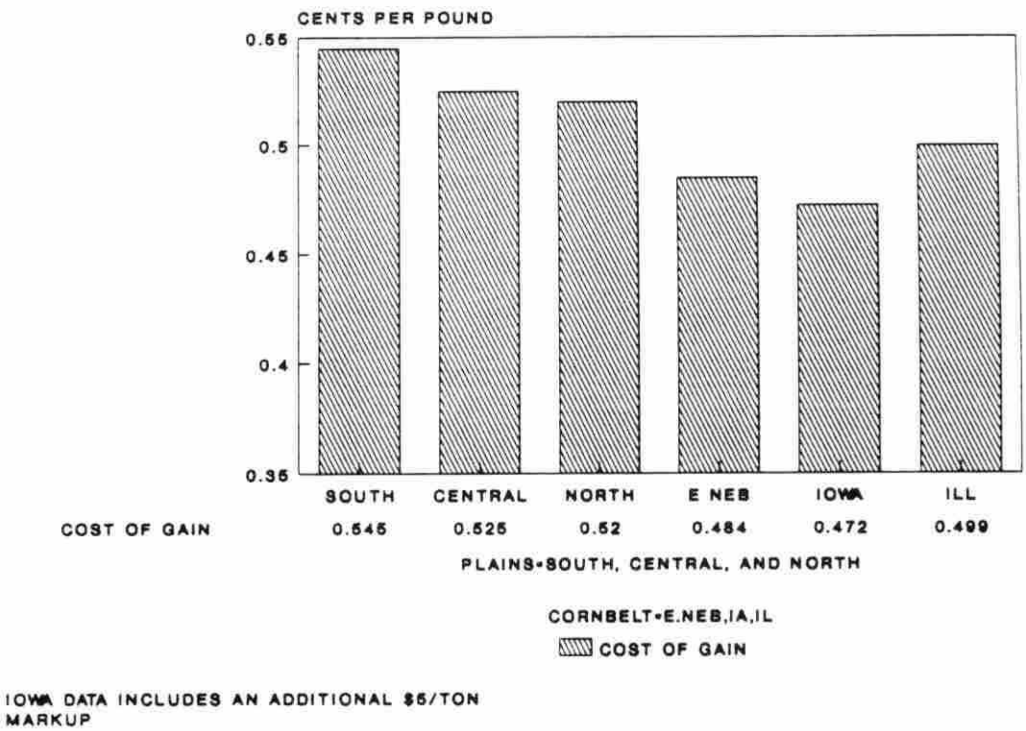



Figure 10. Cost per pound of gain less interest and including mortality costs, by region

The Corn Belt had the least cost per pound of gain, despite poorer feeding efficiencies. Iowa had the least cost per pound of gain of all regions observed, whereas the southern Plains had the greatest. Cost of gain became progressively less when moving south to north through the Plains.

## Total Cost of Production Per Steer and Estimated Break-Even Point

Although cost per pound of gain is the aspect of cattle feeding most often referred to, it is the combination of initial cost, total cost of weight gain, and interest that creates the total cost of production (TCOP). Table 4 represents an attempt to combine all costs and compare the totals with ending weights for an estimated break-even point. The data are a gross estimate of the total costs incurred in producing steers for slaughter. Figure 10 provides a comparison of the break-even points on a regional basis.

Interest was calculated at a simple rate of 12 percent on the total value of the feeder steer plus half of the cost of gain per ton of feed. This rate assumes away any possible financing advantages of one region over another with regard to the cost of borrowing money, yet allows us to consider interest cost differences related to regional cattle-feeding trends as they affect initial investments, cost of gain per ton of feed, and time.

The estimated break-even point is determined by spreading the total cost of production over the ending weight of the steer and is a cost of production per hundred pounds of ending liveweight: (TCOP/EW) * 100. The greatest total

Table 4. Production costs, 1989

| | Plains | | | Corn Belt | | |
|---|---|---|---|---|---|---|
| | South[a] | Central[b] | North[c] | Eastern Nebraska[d] | Iowa[e] | Northern Illinois[f] |
| Delivered in-cost/cwt | $ 81.28 | $ 81.74 | $ 80.04 | $ 82.57[g] | $ 84.53 | $83.93 |
| In-weight/head(lb) | 702 | 737 | 796 | 759 | 681 | 691 |
| End-weight/head(lb) | 1,149 | 1,153 | 1,230 | 1,194 | 1,185 | 1,142 |
| Gain/head (lb) | 447 | 416 | 434 | 435 | 504 | 451 |
| Average days on feed | 160 | 137 | 139 | 140 | 184 | 168 |
| Average daily gain (lb) | 2.79 | 3.03 | 3.12 | 3.11 | 2.74 | 2.68 |
| Feed (dm)/gain (lb) | 6.64 | 6.37 | 6.74 | 6.88 | 7.49 | 7.30 |
| Tons of feed/head | 1.48 | 1.33 | 1.46 | 1.50 | 1.89 | 1.65 |
| Finishing ration ($/ton) | 156.21 | 151.56 | 141.13 | NA | NA | NA |
| Markup ($/ton) | 27.50 | 26.25 | 24.25 | 21.00[h] | 25.00[i] | 24.00 |
| Gain cost[j] ($/ton) | 164.06 | 164.71 | 154.21 | 140.84 | 126.07[k] | 136.79 |
| Cost of gain[l] ($/lb) | 0.5447 | 0.5246 | 0.5197 | 0.4845 | 0.4721 | 0.4993 |
| Total gain cost ($/hd) | 243.48 | 218.23 | 225.55 | 210.16 | 237.94 | 225.18 |
| Total in-cost ($/hd) | 570.59 | 602.42 | 637.12 | 626.71 | 575.65 | 579.96 |
| Projected interest[m] ($/hd) | 36.42 | 32.05 | 34.26 | 33.70 | 42.02 | 38.25 |
| Total cost ($/hd) | $850.48 | $852.71 | $896.94 | $871.16 | $855.61 | $843.39 |
| Estimated break even cost/cwt | 74.02 | 73.96 | 72.92 | 72.96 | 72.20 | 73.85 |

Table 4 (continued)

[a]Data summarized from feedlot closeouts on more than 212,000 steers.

[b]Data summarized from feedlot closeouts on more than 1.474 million steers.

[c]Data summarized from feedlot closeouts on more than 399,600 steers.

[d]Data summarized from feedlot closeouts on 30,968 steers and provided by Farr Nutritional Services, Duncan, Nebraska.

[e]Data summarized from the State of Iowa Feedlot Summary on 76,895 steers, provided by the Iowa State University Cooperative Extension Service.

[f]Data provided by DeKalb Feeders, Inc., DeKalb, Illinois, representing 35,963 steers.

[g]1989 Data not available; substituted September 1988-August 1989 average, Sioux Falls, 700- to 800-pound USDA #1, medium-frame steers + $0.35 freight.

[h]Estimated.

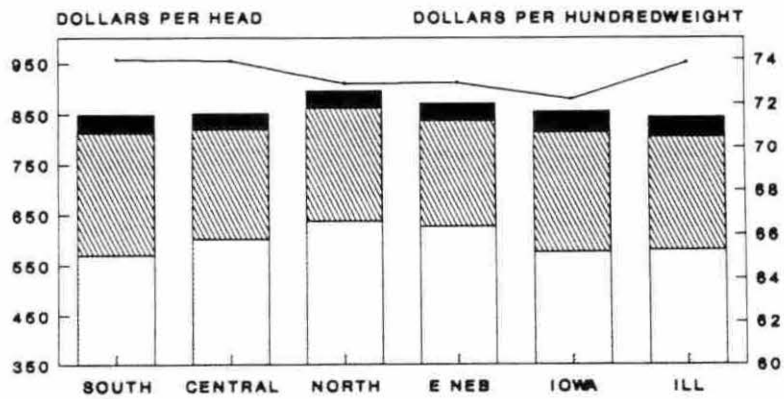
[i]Original data indicated at $20/ton nonfeed cost; additional $5/ton markup was added.

[j]Includes all costs incurred while on feed, less interest.

[k]Original data indicated cost of gain per ton of feed at $121.01; $126.07 includes additional $5/ton markup.

[l]Includes deads, less interest.

[m]Projected at 12% simple interest on full value of feeder plus one-half of gain cost.




| | SOUTH | CENTRAL | NORTH | E NEB | IOWA | ILL |
|---|---|---|---|---|---|---|
| EST BRK-EVN/CWT | 74.01 | 73.95 | 72.92 | 72.96 | 72.2 | 73.85 |
| TOT COST/HD | 850.47 | 852.69 | 896.93 | 871.17 | 855.62 | 843.38 |
| INTEREST/HD | 36.41 | 32.04 | 34.26 | 33.7 | 42.02 | 38.24 |
| GAIN COST/HD | 243.48 | 218.23 | 225.55 | 210.76 | 237.95 | 225.18 |
| IN COST/HD | 570.58 | 602.42 | 637.12 | 626.71 | 575.65 | 579.96 |

PLAINS • SOUTH, CENTRAL, AND NORTH

CORNBELT•E.NEB,IA,IL

IN COST/HD
GAIN COST/HD
INTEREST/HD
EST BRK-EVN/CWT

INTEREST RATE ESTIMATED AT 12%

Figure 10. Estimated total cost and breakeven point per hundred pounds, by region

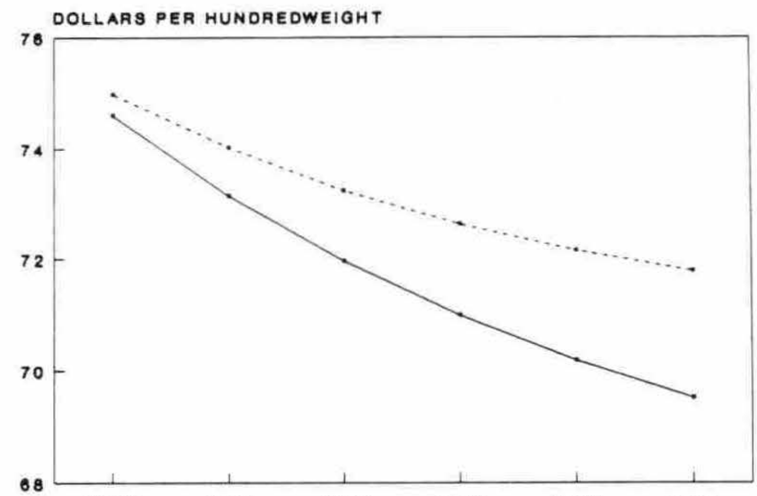
dollar cost of production per steer is located in the Northern Plains, which produces steers with the heaviest ending weights (see Figure 10). The least total dollar cost of production per steer is in Illinois, which produces steers with the lightest ending weights. The final cost-of-production indicator (break-even point), however, favors Iowa.

The migration and evolution of the cattle-feeding industry and the factors driving it are documented earlier in this paper. From the Corn Belt farmer-feeder period, centering in Iowa during the 1950s and 1960s, and the industry's migration south to the high Plains, centering in the Texas panhandle in the 1970s, there is some evidence that the industry moved back north and to the central Plains in the late 1980s.

Effect of ending weight on break-even point

Figure 11 was derived by holding costs and performances constant while varying ending weights for both the southern Plains and Iowa. Average daily gain and feed-conversion rates will vary, however, depending on farm size and the age, sex, and fat composition of the cattle. In both Iowa and the southern Plains, break-even costs decline as cattle are fed to heavier ending weights and decrease at a decreasing rate as cattle reach heavier ending weights, declining at a decreasing rate as cattle reach these heavier weights. Although break-even costs are fairly close at lighter weights, Iowa's advantage is greater at greater weights than is that for the southern Plains. This trend may help explain why the average ending weight in the 1989 data was lighter in the southern Plains (1,149 pounds) than in Iowa (1,185 pounds).

It is possible that the price received for the production of additional pounds beyond the 1,150-pound ending weight has not been cost effective over time in the southern




| | 1050 | 1150 | 1250 | 1350 | 1450 | 1550 |
|---|---|---|---|---|---|---|
| EST BREAKEVEN/SOUTH | 74.98 | 74.02 | 73.24 | 72.63 | 72.15 | 71.78 |
| EST BREAKEVEN/IOWA | 74.61 | 73.14 | 71.95 | 70.98 | 70.18 | 69.52 |

X AXIS REPRESENTS ENDING WEIGHT

EST BREAKEVEN/SOUTH — EST BREAKEVEN/IOWA

INWEIGHTS, COSTS, AND PERFORMANCES WERE HELD CONSTANT

Figure 11. Cost of production comparisons, estimated breakeven costs, Iowa and the South Plains

Plains, whereas expenses incurred in Iowa have been cost effective as the steers approach 1,200 pounds. Beyond 1,200 pounds, price discounts for excessively fat or heavy steers may be too great to continue to heavier ending weights when cattle are targeted for the domestic market. If a region can produce to heavier ending weights without price discounts for excess fat or weight, the low-ration-cost regions may have incentive to produce steers with heavier ending weights that yield a greater percentage of USDA Choice and Prime beef. If greater feed efficiencies and greater ration costs are more competitive at lighter ending weights, then those regions may target a lower USDA Choice or higher USDA Select product, whereas low-ration-cost regions will target a greater percentage of the USDA Choice market.

## FEEDING CATTLE FOR THE JAPANESE AND U.S. MARKETS

An advantage of the detailed method used here to compare feeding costs is the ability to analyze how these costs would evolve under different feeding regimes. For example, the Japanese market has recently been liberalized. This market rewards the producer for adding intramuscular fat, or marbling, to animals, which necessitates many additional days on feed. To see how regional beef producers will compete for this market, consider how the additional days on feed will influence feed-conversion efficiencies as well as optimal purchase and sales weights. This analysis follows. Perhaps not surprisingly, the analysis shows that regions with current competitive positions based on cheap feed grains are likely to dominate this new market.

A second scenario worth examining is the likely regional impact of a continuing trend toward leaner (Select) beef in the U.S. market. The regions that do best under this regime are those that do worst under the Japanese scenario. This raises the interesting possibility that the grain-surplus regions of the United States will prosper only so long as U.S. exports of high-quality beef expand. These new markets may in fact "save" the industry in these regions if the U.S. market follows California's lead toward leaner beef.

Scenario A: Producing Beef for Japan

If all feeding regions were to continue to feed steers to 1,500 pounds to achieve a greater degree of marbling for the Japanese market, several differences may occur. Cattle must remain on feed longer. The animal will be maturing and reaching the end of its growth curve. As the animal stops growing, weight gain will be in the form of external, internal, and intramuscular fat, or marbling. The animal will require more feed to produce an additional pound of gain, which raises the cost of gain. Regions with the advantage is feeding efficiency will begin to lose ground because of inefficient weight gains attributed solely to fat deposition. Feedlots or feeding regions with greater initial feed costs might find it difficult to be competitive as feeding efficiencies deteriorate. Table 5 presents projected cost performances based on data from Table 4. The projected cost of gain shown in Figure 13 is the least in the Corn Belt, with the least increase in Iowa. Estimated break-even points gradually decrease when moving toward the western Corn Belt.

Once the animal reaches slaughter weight, the packing-house location may be important when considering the cost of transporting the meat to the West Coast for export. Cost-of-production disadvantages could conceivably be offset by meat transportation costs. A 1,500-pound live steer, when

Table 5. Estimated regional production-cost differences for the Japanese market

| | Plains | | | Corn Belt | | |
|---|---|---|---|---|---|---|
| | | | | Eastern | | Northern |
| | South | Central | North | Nebraska | Iowa | Illinois |
| In-cost per cwt | $81.28 | $81.74 | $80.04 | $82.72 | $84.53 | $83.93 |
| Pay weight, in (lb) | 702 | 737 | 796 | 759 | 681 | 691 |
| Pay weight, out (lb) | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Total gain/head (lb) | 798 | 763 | 704 | 741 | 819 | 809 |
| Additional gain (lb) | 351 | 347 | 270 | 306 | 315 | 358 |
| Additional days on feed | 153 | 137 | 103 | 118 | 141 | 164 |
| Total days on feed | 313 | 274 | 242 | 258 | 325 | 332 |
| Average daily gain[a] (lb) | 2.55 | 2.78 | 2.91 | 2.87 | 2.52 | 2.44 |
| Feed (dm)/gain[b] (lb) | 7.51 | 7.28 | 7.51 | 8.10 | 8.36 | 8.39 |
| Tons of feed/head | 3.00 | 2.78 | 2.64 | 2.86 | 3.38 | 3.31 |
| Gain cost/ton of feed | $164.06 | $164.71 | $154.21 | $140.84 | $126.07 | 136.79 |
| Cost of gain (less interest) | $0.6169 | $0.5995 | $0.5788 | $0.5426 | $ 0.5205 | 0.5598 |
| Total gain cost | $492.26 | $457.42 | $407.51 | $402.11 | $426.36 | $452.91 |
| Total in-cost | $570.58 | $602.42 | $637.12 | $626.71 | $575.65 | $579.96 |
| Projected interest[c] | $84.12 | $74.91 | $66.92 | $70.00 | $84.19 | $88.08 |

Table 5 (continued)

| | Plains | | | Corn Belt | | |
|---|---|---|---|---|---|---|
| | South | Central | North | Eastern Nebraska | Iowa | Northern Illinois |
| Total production cost | $1,146.96 | $1,134.76 | $1,111.54 | $1,098.82 | $1,086.20 | $1,120.94 |
| Break-even cost/cwt | $76.46 | $75.65 | $74.11 | $73.25 | $72.41 | $74.73 |
| Export cost/head | $26.10 | $30.45 | $27.18 | $39.15 | $43.50 | $47.80 |
| Total cost to export | $1,173.06 | $1,165.11 | $1,138.72 | $1,137.97 | $1,129.70 | $1,168.74 |
| Estimated break-even cost to export | $78.20 | $77.68 | $75.91 | $75.86 | $75.31 | $77.92 |

Note: The following assumptions were made: average daily gain for the added weight gain required will be one-half pound less than for the earlier fattening period; feed conversion for the added weight gain required will add two pounds of feed per pound of liveweight gained. Assumptions drawn from research conducted at ISU.

aProjected average daily gains reduced by 0.5 pound per day for additional time period.
bTwo pounds of feed per pound of gain was added when calculating additional weight gain.
cProjected at 12% simple interest on full value of in-cost plus one-half of feed bill.

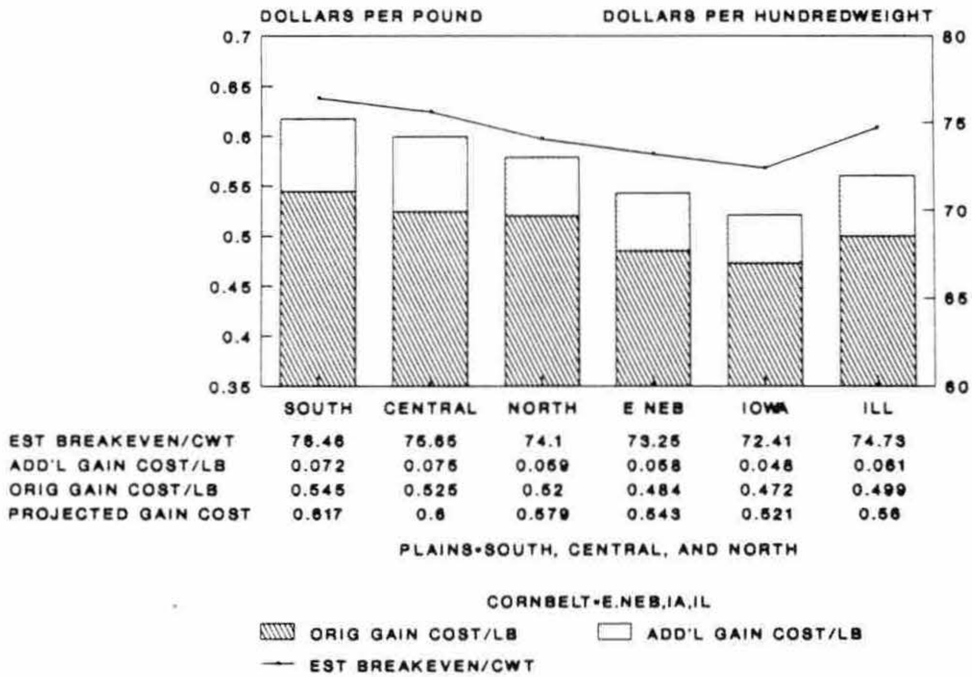


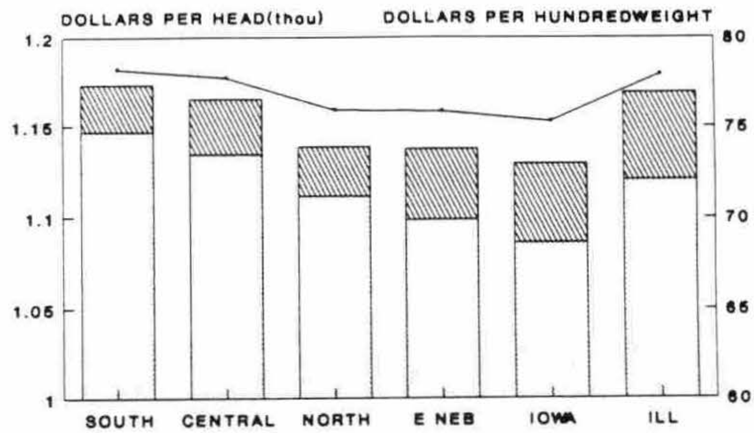

Figure 12. Additional cost of gain and estimated breakeven point, by region

slaughtered and the carcass is trimmed for export to Japan, will yield approximately 58 percent hot weight, or 870 pounds. Approximately 46 carcasses would fill one 40,000-pound ocean container. Table 3 lists approximate rates from various packinghouses to California export points and a per-head transportation cost. Carcass fabrication and transportation information was collected from July through August 1990, from telephone surveys with beef packers, exporters, and freight companies involved in the region questioned.

Figure 13 includes the cost of transporting meat to the West Coast for export. As shown, Iowa continues to hold a slight advantage over all the regions observed, but delivered estimated break-even points are similar in Iowa, eastern Nebraska, and the northern Plains.

Two factors are important in analyzing the estimated regional differences for the Japanese market. First, although feeding efficiencies were decreased, they were reduced equally for every region. If a region accustomed to better feeding efficiencies can minimize efficiency loss more effectively than can regions not accustomed to that advantage, the increased total cost of production will be less.

Second, it should be noted that per-ton production costs were held constant. Any change, if not proportional among regions, will change the variance. If, for example, a region's production cost includes feeding an animal with a less expensive ration to avoid an expensive finishing ration until necessary, the loss of feeding efficiencies plus a disproportionately greater finished-ration usage will amplify the cost. If a region has a disproportionately less high-concentrate finishing ration, the cost of production for the additional weight gain may be almost unnoticed when comparing




| | SOUTH | CENTRAL | NORTH | E NEB | IOWA | ILL |
|---|---|---|---|---|---|---|
| EST BREAKEVEN $/CWT | 78.2 | 77.68 | 75.91 | 75.86 | 75.31 | 77.92 |
| DELIVERED COST | 1.173 | 1.166 | 1.139 | 1.138 | 1.13 | 1.169 |
| FREIGHT $/THOUSAND | 0.026 | 0.03 | 0.027 | 0.039 | 0.044 | 0.048 |
| TOTAL COSTS/THOUSAND | 1.147 | 1.136 | 1.112 | 1.099 | 1.086 | 1.121 |

EST BREAK EVEN IN $/CWT LIVE WEIGHT

TOTAL COSTS/THOUSAND   FREIGHT $/THOUSAND
EST BREAKEVEN $/CWT

NORTH PLAINS FRT TO XPORT BASED
ON NE COLO AND W NEB AVERAGE

Figure 13: Estimated cost of production plus freight to export point, by region

original break-even points with the break-even points at heavier ending weights.

In most instances, the additional days on feed almost equal the original days on feed. In the southern and central Plains, feed use per head doubled. These factors are important when comparing regions, especially in the northern Plains, eastern Nebraska, and Iowa, where delivered-to-export break-even estimates are within $9/head. When shipping in fabricated form to eliminate fat, bone, and unwanted cuts,

Table 6. Transportation costs from packinghouses to West Coast destinations

| Origin | Destination | Cents per pound | Fabricated ($/head) | Carcass ($/head) |
|---|---|---|---|---|
| Yakama or Pasco, Washington | Seattle or Portland | 1.50<br>2.00 | 6.0<br>8.0 | 13.00<br>17.40 |
| Boise, Idaho | Portland,<br>Los Angeles | 1.30<br>2.45 | 5.2<br>9.8 | 11.30<br>21.30 |
| Greeley, Ft. Morgan, or Sterling, Colorado | Los Angeles | 2.50 | 10.0 | 21.75 |
| Dodge/Garden City, Kansas | Los Angeles | 3.50 | 14.0 | 30.45 |
| Amarillo, Texas | Los Angeles | 3.00 | 12.0 | 26.10 |
| Lexington or Grand Island, Nebraska | Los Angeles | 3.75 | 15.0 | 32.60 |
| Sioux City, Iowa | Los Angeles | 4.50 | 18.0 | 39.15 |
| Des Moines, Iowa | Los Angeles | 5.00 | 20.0 | 43.50 |
| Chicago, Illinois | Los Angeles | 5.50 | 22.0 | 47.80 |

Note: Data were gathered in July and August 1990 from interstate transportation companies and meat exporters.

however, a larger number of cattle equivalent units can be shipped at a set rate. This per-head freight reduction provides an advantage to the more distant cattle-feeding regions and, thus, would slightly increase Iowa's advantage.

Scenario B: A Trend Toward Leaner Beef for the U.S. Market

The preceding analysis demonstrates the advantage of regions with lesser relative feed costs in producing very marbled beef. Would a health-driven trend toward leaner beef make regions with cheaper feed costs uncompetitive?

If regions started at identical lighter weights, and feedlot performances were held constant, the break even differences would depend upon the relationship between incosts and costs of grain.

Figure 14 compares Iowa and the South Plains when starting with the 650 pound inweight steer. Incosts were established by using the U.S. Department of Agriculture's 1989 yearly average direct trade price for a medium framed feeder steer with number 1 muscle thickness and weighing 600-700 pounds from Texas and Iowa. The average price in Texas was $85.78 per hundred pounds of live weight and Iowa was $85.88 per hundred pounds of live weight.

Clearly the region with the lowest cost of grain has the lowest breakeven point out of all weights. Although this scenario is unrealistic, it does show the impact the initial

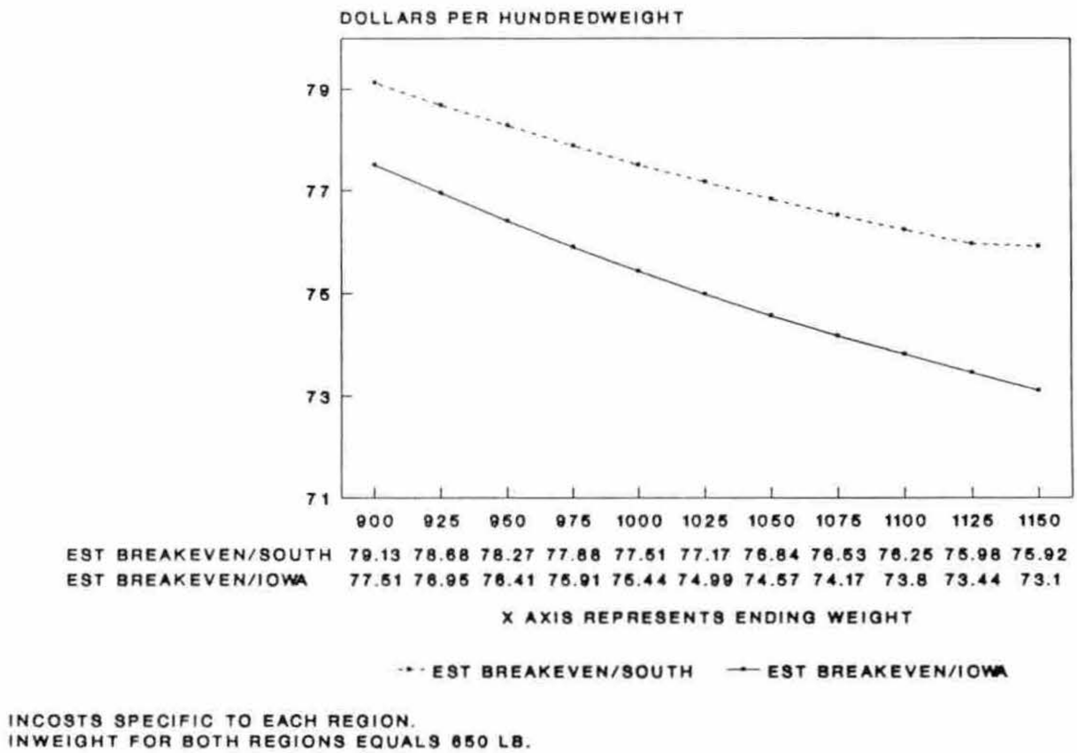



Figure 14. Estimated breakeven points for lighter end weights, Iowa versus South Plains starting with 650 pound feeder steers

costs and weights can have on a region with high cost of grain.

Figure 15 compares break-even points for the two extremes (Iowa and the southern Plains) at different ending weights while holding inweights and incosts constant but uniformly improving feedlot performance. Average daily gain was improved one-half pound per head per day and feed conversion was improved by two pounds of feed per pound of gain.

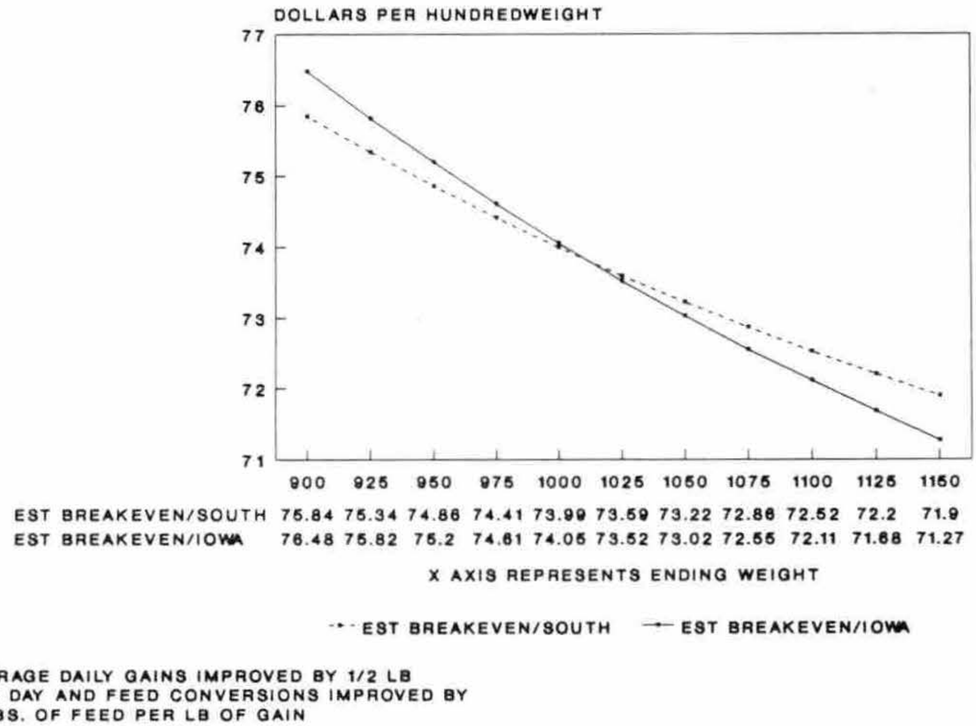



Figure 15. Estimated breakeven points for lighter end weights, Iowa versus the South Plains

These results show how Iowa's feed cost advantage depends on a continuing domestic and international demand for heavy animals. In feeding cattle to weights of less than 1,000 pounds, Iowa loses its advantage to regions with cheaper feeder-cattle supplies or better feed efficiencies.

These results are based on 1989 prices and performance ratios. Had 1990 or 1991 prices been used, slight differences would occur. For example, the point at which

Iowa loses its advantage probably lies within the range from 1,000 to 1,100 pounds and not at exactly 1,012 pounds as is indicated by Figure 15. Regardless of the base year, however, grain-surplus regions will continue to have an advantage in producing animals at heavier weights. Evidence exists that consumers in California and Canada have begun to demand a lighter, leaner product. Should this demand shift occur throughout the United States, beef producers in grain-surplus regions will tend to lose market share to producers in Texas and the southern Plains provided the differences in regional feeding efficiencies remain constant. If Iowa were to improve feeding efficiencies relative to the more efficient regions while maintaining its feed cost advantage, this loss could be reduced or elimated.

## CONCLUSIONS

This paper argues that slow movements in the U.S. cattle-feeding industry are caused by relatively small differences in regional production costs. Detailed and accurate cost-of-production data for 1989 are presented and show that break-even values ranged from $72.20 per hundredweight in Iowa to $74.01 per hundredweight in the southern Plains. Regional costs differ in large part because of different feed costs and feed-conversion efficiencies. Iowa represents one extreme in this tradeoff, and Texas represents the other.

Two scenarios are examined. First, the data are adjusted to examine which region is most promising as a source of heavily marbled beef for export to Japan. The results show that, even when transportation costs are included, Iowa holds an advantage in this market. For finished weights in the other direction, Texas (the southern Plains) has an advantage in producing lighter animals.

The results are based on 1989 data; as with any possible base year, 1989 had some peculiarities that influenced the regional comparisons. A worthwhile project would be to extend this analysis for several more years. Nevertheless, one can conclude that, in almost all years, regions such as Iowa that have a surplus of grain will have a comparative advantage in producing heavily marbled animals. Regions such as Texas that have good feed-conversion efficiencies will have a comparative advantage in producing leaner animals.

Two developments make these comparisons particularly relevant. First, there is an increasingly large export market for heavily marbled animals for Japan. Second, there has been some discussion of a health-driven trend toward leaner beef in the United States. If both trends occur simultaneously, one might conclude that regional specialization will occur, with marbled beef being produced in areas where grain is cheap and lean beef being produced in areas where feed-conversion efficiencies are better. If feed efficiency differences are narrowed, then regions such as Iowa would be able to compete in the leaner beef market while having the advantage of continuing to feed to heavier weights when the proper price signals for heavily marbeled beef arise.

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